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BLEEDING ESOPHAGEAL VARICES: THE EMERGENCY AND DEFINITIVE TREATMENT

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Esophageal varices develop in the majority of patients as the result of an intrahepatic block to the flow of portal blood through the liver, secondary to a Laennec-type of portal cirrhosis. An extrahepatic portal bed block, the result of a thrombophlebitis involving in most instances the main portal vein is the cause in another group of patients. The exact etiology of the latter type is not well known, but it is thought to develop in some patients secondary to a thrombophlebitis of the umbilical vein in infancy following a septic omphalitis. The esophageal varices, in contradistinction to most venous varicosities elsewhere in the body become a serious threat to a patient's life because of frequent rupture of them with a resulting severe, and in many instances, exsanguinating hemorrhage. It has been shown to be one of the common causes of upper gastrointestinal bleeding, since in several reported series, the incidence of bleeding has been 23 to 32 per cent from this condition. The seriousness of it has been recognized for many years.

In three different medical centers when medical measures alone were used, the mortality rate in patients with cirrhosis of the liver after the first hemorrhage from esophageal varices varied from 30 to 50 per cent at the end of a year following the first bleeding episode. The major causes of death in these patients were exsanguinating hemorrhage, and liver failure, in many cases precipitated by esophageal bleeding.

During the past 10 years the improvement in surgical and anesthetic technics have resulted in great advances in the treatment of this condition. The most effective definitive procedure to prevent bleeding from these vessels is a veno-venous anastomosis between the portal and the systemic venous systems. Operations of this type are of such magnitude, especially in patients with cirrhosis of the liver, that at the time of acute bleeding, they should not be performed

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except in unusual circumstances. For this reason it is necessary to have a method of treatment that may be used as an emergency procedure to control the bleeding vessels at the time of acute hemorrhage to prevent exsanguination.

THE EMERGENCY TREATMENT

The majority of patients with severe upper gastrointestinal hemorrhage today are admitted to the emergency ward of a hospital. After the patient's condition is stabilized with the use of blood transfusions if necessary, a roentgenogram of the esophagus and stomach should be obtained to ascertain if possible the source of bleeding. In the great majority of patients with a small amount of barium suspension, it is frequently possible to determine the presence or absence of esophageal varices. In some institutions where an esophagoscopist is available, direct vision of the esophagus may aid in the diagnosis. If bleeding continues, cardioesophageal tamponade should be instituted by the use of an intragastric balloon. This procedure, in addition to controlling the bleeding, is a useful method to differentiate bleeding from esophageal varices, from that of gastric or duodenal origin, since by means of cardioesophageal tamponade, esophageal hemorrhage can be stopped almost immediately, whereas it will have no effect on gastric or duodenal bleeding. When it has been demonstrated that the bleeding can be controlled by cardioesophageal tamponade, and if a surgeon, experienced in the surgery of the esophagus is available, it is recommended that an emergency transthoracic suture of the bleeding esophageal varices should be performed after the blood volume of the patient is restored by multiple transfusions.

This method has been carried out at the Massachusetts General Hospital during the past 7 years. It has been performed in 20 patients by the author. There were 2 deaths directly attributable to the procedure, an operative mortality of only 10 per cent, whereas in the previous 5 year period before this method was used, in a group of 32 patients with massive bleeding esophageal varices treated by medical measures, exsanguination was the cause of death in 23 or 72 per cent of them. This method of treatment is not definitive since recurrent bleeding not infrequently develops after 2 to 3 months. It is merely a stopgap to control the bleeding for a short period of time until the patient's condition can be improved so that the more definitive form of therapy can be carried out, of shunting the portal blood directly into the systemic venous system by means of a splenorenal or a direct portacaval shunt.

PORTACAVAL SHUNT PROCEDURES

Some type of portacaval shunt has been performed in approximately 170 patients by the author at the Massachussett General Hospital from 1945 through 1956. The results obtained with the successful shunts have been extremely encouraging. In this group an end to side splenorenal shunt was performed in approximately 67 per cent and a direct portacaval anastomosis in 33 per cent. Cirrhosis of the liver was the etiologic factor in 85 per cent of the patients. In our clinic at the present time, because of the high mortality rate and morbidity

with direct portacaval shunts, the splenorenal anastomosis is favored when it is possible to construct a satisfactory one.

Splenoportography has not been used as a routine measure to determine which type of shunt to construct because it is not without complications, and in our hands the following simple rule has been used and found satisfactory, in practically all patients: "if a patient has an enlarged spleen, palpable below the costal margin, or if it is demonstrated to be enlarged by a flat abdominal roentgenogram when not palpable, it will be possible to construct a satisfactory splenorenal anastomosis in practically all cases, because the splenic vein will also be enlarged." It has been not possible to construct splenorenal shunts in some of the patients. In the majority of these cases, this had been because of a previous splenectomy, which makes it impossible to utilize the splenic vein at a later date. In a few instances, both the splenic and the portal veins have been found to be occluded from an old thrombophlebitis, thereby precluding the construction of either a splenorenal or a dircert portacaval shunt. For these patients a transthoracic suture of the esophageal varices is performed in preference to an esophagogastrectomy or total gastrectomy. It has the advantage also that it can be repeated if recurrent bleeding develops.

THE SELECTION OF PATIENTS FOR PORTACAVAL SHUNTS

In view of the high mortality rate from the medical treatment of bleeding esophageal varices, it is our opinion that every patient in whom this diagnosis is confirmed should be considered a candidate for some type of portacaval shunt, since at the present time the results following these surgical procedures have been more effective than any other type of treatment. At the present time, however, we have seen little if any improverment in the primary liver condition, so that the operation should not be performed with the expectation that it will improve liver function. It should be stressed also that the construction of a portacaval shunt of any type should not be done for the relief of chronic ascites alone, except in rare instances.

In general, our rule has been that some type of portacaval shunt should be performed in: (1) patients with portal cirrhosis without ascites with bleeding esophageal varices; (2) those with ascites who respond to medical therapy; and, (3) any patient with the so-called Banti's syndrome with bleeding esophageal varices.

The majority of the patients with cirrhosis of the liver are not good surgical risks. For that reason, every effort should be made to improve their condition before proceding with the major surgical proceedure of constructing some type of portacaval shunt. In order to determine their operability, liver function tests should be performed. The following are the most valuable in determining the operability of these patients: (1) The serum albumin level is the most important. If the level is below 3 grams per cent, operation should not be performed until it has been brought up above this figure by diet and if necessary intravenous injections of human albumin. (2) The presence of ascites is also considered to be a test of liver function, indicating the failure of the liver to synthesize the normal

levels of serum protein. If the ascites fail to respond to medical therapy prior to operation, it is a serious omen, whereas if it does clear, the patient is considered a much better operative risk. 3. If the prothrombin time is prolonged and does not improve on vitamin K therapy, it also indicates severe liver disease. Every attempt is made to bring it to as near normal as possible. 4. The cephalin flocuclation test if it is 3 or 4+ also indicates that the patient is a serious risk, whereas if it is 1 or 2+, they are much better risks. 5. The bromsulphalein retention test, which measures the excretory function of the liver apparently is of less significance unless the degree of retention is high, in which case it also indicates a seriously diseased liver. 6. The bilirubin level in the blood, as measured by the small Van den Bergh test, is significant if there is a moderate to severe degree of jaundice. In summary, it can be stated that the following liver function tests indicate that the patient may be a serious operative risk for shunt surgery in the order of their importance according to the author. (1) A serum albumin level below 3 grams per 100 cm.; (2) ascites which fail to respond to medical therapy; (3) a 3+ or 4+ cephalin flocculation; (4) a prothrombin time which remains prolonged more than 4 seconds above normal after adequate vitamin K therapy; (5) an elevated serum bilirubin; (6) a bromsulphalein retention test showing more than 20 per cent dye retention after 30 minutes.

THE RESULTS OF SHUNT PROCEDURES

There is still in the minds of many of the profession considerable doubt as to whether a portacaval shunt of any type prolongs the life or reduces the morbidity of bleeding esophageal varices. In a recent publication an analysis has been made of our results after utilizing this method of therapy for a 10 year period.

OPERATIVE MORTALITY

An analysis of our operative results revealed that in a group of 131 patients 114 or 87 per cent survived some type of shunt procedure, and 17 or 13 per cent died directly as a result of the operative procedure. The mortality rate was highest in the intrahepatic group of patients, since in 110 operations there were 16 deaths, or an operative mortality of 15 per cent, while in 31 operations in patients with an extrahepatic portal block, there was only 1 death, or an operative mortality of 3 per cent. Early postoperative hemorrhage, due to uncontrollable bleeding from the operative field, was the cause of death in 5 patients. In recent years, this cause of postoperative deaths fortunately has been conquered, since in the last 5 years in 93 operative procedures, it has not been a factor in any of the deaths. The use of 1 to 3 fresh blood transfusions during the operation to replace in part the blood loss, and the institution of hypotensive spinal anesthesia to reduce blood loss during the operation, have been important measures in preventing postoperative deaths in shunt procedures from this complication.

The over-all operative mortality has been improved in recent years as is shown in the following figures. From 1945 through 1949, 48 shunts were performed and attempted, and in this group 10 or 21 per cent of the patients died. During the second 5 year period, 93 shunt procedures were done or attempted

with only 7 deaths or an operative mortality rate of 8 per cent, which compares well with the mortality rate for other operative procedures of a similar magnitude. This reduction in the operative mortality, it is believed, is the result of a number of factors which include: 1. A more careful preparation of patients. 2. The control of severe esophageal hemorrhage by emergency transesophageal suture of the esophageal varices. 3. The use of fresh blood transfusions during the operative procedure. 4. The utilization of hypotensive spinal anesthesia to reduce blood loss during the operation; and finally, 5. The perfection of the technic of this type of surgery.

POSTSHUNT ESOPHAGEAL BLEEDINGS

The true value of portacaval shunt surgery to control esophageal bleeding can be determined best by an analysis of the results obtained in those patients who have survived and could be followed for a year longer after a splenorenal or a direct portacaval shunt has been performed. It has been possible to study 92 patients for this evaluation. Sixty-six or 72 per cent had splenorenal shunts and 26 or 28 per cent had direct portacaval shunts. Seventy-eight or 85 per cent of the patients had an intrahepatic type of portal bed block secondary to cirrhosis of the liver and 14 or 15 per cent had the extrahepatic type. In 55 or 70 per cent of the patients with an intrahepatic type of block, a splenectomy and end to side splenorenal anastomoses were performed and a direct portacaval anastomosis in 23 or 30 per cent of them. Recurrent esophageal bleeding occurred in 11 or 20 per cent of the patients who had splenorenal shunts. It was mild, not requiring transfusions in 4 or 7 per cent of them, and major in 7 or 13 per cent. Secondary direct portacaval anastomoses were constructed in 3 of the latter. Two of the other 4 died from massive hemorrhage approximately 1 year after the splenorenal shunts were constructed in each case. This makes a postoperative mortality rate for the splenorenal shunt group from esophageal bleeding of 3.6 per cent. It is a great improvement over the death rate from esophageal bleeding in patients who are treated with medical measures, which has been reported to be 50 per cent within 1 year after the first hemorrhage.

Recurrent bleeding was less common following the direct portacaval anastomoses. This type of shunt was performed in the other 23 patients with cirrhosis of the liver. There were no episodes of minor bleeding in this group, and only 2 or 9 per cent developed major bleeding. It is of extreme significance that the portal vein in each of the patients who bled was found occluded by a thrombus at the time the shunt was performed, and in all probabliity recurrent thrombosis developed to occlude the shunt and explain the recurrent bleeding. There were 14 patients with an extrahepatic type of portal bed block. Eleven or 79 per cent of them had splenectomy and end to side splenorenal shunts, and 3 or 21 per cent of them had direct portacaval shunts. Recurrent bleeding developed in 2 or 18 per cent of the patients with splenorenal anastomoses. In 1 it was minor and in the other it was major. It occurred in 1 patient following a direct portacaval shunt, but in this case the portal vein was found diseased from an old thrombophlebitis.

SUMMARY AND CONCLUSIONS

The transthoracic transesophageal suture of bleeding esophageal varices is recommended as an emergency form of treatment in those patients in whom balloon tamponade is necessary to control massive esophageal hemorrhage. In addition to obtaining immediate control of the hemorrhage by this procedure, it also gives a period of 4 to 6 weeks in which to prepare these sick patients for the all major surgical procedure of constructing some type of portacaval shunt.

The most effective definitive treatment of bleeding esophageal varices that has been developed to date is the construction of either a splenorenal or a direct portacaval venous shunt. The success of this type of surgery in many of these critically ill patients demands the close cooperation of the internist, the surgeon, and the anesthesiologist.

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SUPRAHYOID NECK DISSECTION FOR EPIDERMOID CARCINOMA OF THE LOWER LIP: AN APPRAISAL OF ITS USE IN ONE HUNDRED AND THIRTY PATIENTS

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In the treatment of metastases to lymph nodes from epidermoid carcinoma of the lower lip there has been a tendency to discard the more conservative suprahyoid and supraomohyoid operations in favor of the complete or radical neck dissection.[1, 5, 7] The reasoning upon which this change has been based is as follows; when submental or submaxillary lymph nodes are involved there is great likelihood that deep cervical lymph nodes are also. Consequently a complete en bloc removal of all cervical node areas is more satisfactory than the suprahyoid—first and the deep dissection later. In addition the mortality rate of complete neck dissection is not significantly higher than that of the more conservative, limited dissections in persons under 65 years of age. While one may easily agree with the logic employed, the proof of effectiveness (or lack of effectiveness) of a surgical procedure applied to cancer must rest on the actual accomplishments of that procedure. In the case of lymph node dissections the effectiveness of a given operation can only be evaluated from the data of cases in which thorough pathologic study has demonstrated lymph node involvement. The removal of normal nodes cannot be expected to affect the disease if there are no demonstrable metastases in them.

Despite the numerous reports of treatment of cancer of the lip which have been published, evaluation of the results of specific types of neck dissection in the treatment of lymph node metastases is practically impossible. Taylor and Nathanson[8] report 58 per cent of 96 patients with lymph node involvement to be cured by suprahyoid neck dissection for a three year period. Better results than these have not been reported. However, the relative effectiveness of the suprahyoid versus the radical block procedure cannot be determined in these series. For example, Cross, Guralnick and Deland[2] state that in most of their cases a supraomohyoid operation was carried out but that in some patients a radical neck dissection was performed. Modlin[7] does not separate the cases in his series into the types of operation performed, but in the discussion which follows agrees with Slaughter that radical neck dissection is indicated. Barclay, Peltier and Kremen[1] state that in most of their cases supraomohyoid dissection was done, but that in recent years they tend to do a radical neck dissection; however, the cases are not separated in giving the end results.

It therefore occurred to us that further clarification of this problem might be obtained from a study of patients with epidermoid carcinoma of the lower

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lip treated at the Barnard Free Skin and Cancer Hospital in St. Louis where for a number of years suprahyoid neck dissection was almost exclusively employed in the treatment of cervical lymph node metastases from cancer of the lower lip. It is the purpose of this paper to present the results of this study.

The suprahyoid neck dissection carried out consisted of the removal of the contents of the submental and submaxillary triangles. For lesions encroaching upon the midline or when clinical evidence of bilateral or contralateral spread existed, both sides were dissected. In most cases, however, a unilateral dissection was performed.

Material: From the years 1934 to 1948, 130 cases were available for review. In 40 patients no clinical evidence of lymph node metastasis existed at the time of neck dissection. This group may be classified as "prophylactic" neck dissections. The size of this group is not attributable to any conviction that routine neck dissection should accompany treatment of the primary carcinoma of the lip, but to the fact that all of the patients were indigent and that many came from long distances for treatment, thus making close follow-up impossible. In 4 of these patients lymph node metastases were proved at the time of pathologic examination, an incidence of 10 per cent, which strikingly parallels the incidence of lymph node metastases in prophylactic neck dissections for cancer of the lip reported by others.[7, 8]

In the remaining 90 patients clinical evidence of lymph node metastases existed at the time of operation. In this group, pathologic confirmation of the clinical impression was possible in 43 cases (47.8 per cent) (table 1).

No patient whose primary lesion was controlled and in whom the lymph nodes were considered by the pathologist to be uninvolved developed evidence of cervical lymph node involvement in the course of the 5 year follow-up. This would discount the claims of those who have doubted the value of the pathologic report in evaluating the results of prophylactic neck dissection.

Results: The results in the 47 patients with positive lymph nodes are given in table 2.

The mortality rate for the entire series of 130 patients is 2 or 1.5 per cent. It will be noted that in 10 patients the primary lesion was not controlled. These patients are unsatisfactory for the evaluation of the role of suprahyoid neck dissection. Four patients were lost to follow-up and are considered to be therapeutic failures. Three patients died of other causes in less than 5 years, but at the time

TABLE 1

Incidence of lymph node involvement in 130 suprahyoid neck dissections for cancer of the lower lip

	Lymph Nodes Positive	Lymph Nodes Negative	% Positive
Prophylactic	4	36	10
Therapeutic	43	47	47.8
Total	47	83	

TABLE 2

Results of suprahyoid neck dissection in 47 cases with involved nodes

	Prophylactic	Therapeutic	Total
Operative mortality	0	2	2
Primary uncontrolled	1	9	10
Lost to follow-up	0	4	4
Died less than 5 yrs. cancer controlled	0	3	3
Persistent cancer in neck	1	14	15
Cured	2	11	13 (27.7%)
Total	4	43	47

TABLE 3

Curability of cancer of lip with involved cervical lymph nodes (primary controlled)

Author	No. of Cases	Cured (%)
Taylor and Nathanson	96	58 (3 yr. follow-up)
Barclay, Peltier and Kremen	39	46.2
Cross, Guralnick and Deland	33	42.4
Modlin	25	52
Present series	33	38.2

of death there was no evidence of cancer. In 15 patients persistence of the neoplasm in other portions of the neck was noted at some time after the suprahyoid neck dissection. Thirteen patients were cured, an absolute cure rate of 27.7 per cent. When corrected for the patients in whom the primary lesion was not controlled, or where death occurred in less than 5 years with control of cancer up to the time of death, the cure rate is 38.2 per cent.

In this series there were no late recurrences beyond the 5 year period in either the primary lesion or the cervical lymph nodes.

DISCUSSION

Neither the absolute cure rate of suprahyoid neck dissection as carried out in this series, nor the corrected cure rate, compare favorably with the curability rate reported by others (table 3). The difference, however, is not nearly as striking as the information obtained by analyzing the treatment failures. The factors noted by others indicating a poor prognosis for patients with cervical lymph node involvement, namely, multiplicity of nodes, bilateral nodes, size and fixation of nodes, extension through the capsule, etc., were only occasionally significant. Of greatest importance was the observation that in 12 of the 15 patients with persistence in the neck *the first evidence of persistence was in the superior deep cervical lymph nodes* (jugulo-digastric nodes). In the remaining 3 patients the first evidence of persistence was in the middle deep cervical lymph nodes, the inferior deep cervical lymph nodes and the supraclavicular lymph nodes respectively. In

these patients it is unlikely that salvage could have been achieved by a more radical surgical approach. In the 12 cases in which the persistence was immediately adjacent to the operative field of the suprahyoid neck dissection, radical neck dissection would likely have resulted in an increase in the number of cured patients. Of these patients, one had a radical neck dissection 8 months after the initial partial operation and is cured of cancer. Another patient had a supraomohyoid operation within 2 months of the first procedure, but at the time of this operation tumor was grossly transected and, as one would anticipate, the tumor promptly recurred, death occuring 7 months later. In 3 patients a second operation was recommended but refused. Intensive external roentgen therapy at this time failed to control the disease. In the other patients only palliative doses or radiation therapy were given.

Since only one patient was controlled by the later completion of the radical neck dissection an attitude of watchful waiting after suprahyoid neck dissection does not appear to be justified. The plan of Kennedy[3, 4] and of Ward and Hendrick[9] of immediately proceeding with a more radical operation if the nodes are found to be involved at suprahyoid neck dissection while better than suprahyoid neck dissection alone is, in our opinion, less satisfactory than immediate radical neck dissection. The diagnosis is not always possible during the first operation thereby necessitating a second stage. Furthermore, the removal of the contents of the lateral neck in pieces violates the principle of en bloc removal which is, of course, fundamental in cancer surgery.

SUMMARY AND CONCLUSIONS

The end results following suprahyoid neck dissection in a series of 130 cases of epidermoid carcinoma of the lower lip are given. The operation was used in the absence of clinical evidence of metastases in 40 patients and in the presence of clinical evidence of lymph node involvement in 90 patients. In 4 or 10 per cent of the first group positive lymph nodes were found while in 49 or 47.8 per cent of the second group the lymph nodes were positive. The operative mortality rate was 1.5 per cent. The absolute curability rate of patients with positive nodes was 27.6 per cent, the corrected curability rate was 38.2 per cent. In 12 of 15 recurrences in the neck the nodes immediately adjacent to the field of the suprahyoid operation were first observed to be involved. Suprahyoid neck dissection is therefore concluded to be an unsatisfactory definitive procedure for lymph node metastases from epidermoid carcinoma of the lower lip.

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CONGENITAL TRACHEO-ESOPHAGEAL FISTULA WITHOUT ESOPHAGEAL ATRESIA: AN IMPROVED METHOD OF DEMONSTRATION*

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INTRODUCTION

During the past 2 decades and appearing infrequently in the literature have been reports of tracheo-esophageal fistulas without congenital atresia of the esophagus. It is significant that many of these cases reported were only diagnosed at post mortem. This would appear to be unjustifiable and yet when one realizes the difficulty encountered in making the diagnosis and demonstrating to the surgeon the vital preoperative information as to the location, size and extent of the fistula, one realizes that proving the fistula to be present has not been easy.

Let us for a moment review the usual type of tracheo-esophageal fistulas from a drawing by Stephens, Mustard and Simpson[11] in a recent article summarizing their experience in 138 cases of congenital atresia of the esophagus with tracheo-esophageal fistulas (fig. 1).

In type A there is esophageal atresia with a connection between the distal esophageal segment and the trachea. Approximately 88 per cent of their cases fell in this category.

Type B comprised approximately 5 per cent of their cases and is that abnormality where complete congenital atresia occurs without any fistulous communication between the esophagus or trachea.

In type C there is a congenital fistula between the esophagus and trachea with no atresia. This type comprised approximately 3 per cent and is the one we are speaking of today.

In type D we have a fistula between the proximal and distal esophagus and trachea and this occurred in 2 plus per cent of the cases.

Type E has a fistula between the proximal esophagus and trachea only and accounted for 1.5 per cent of the cases.

As mentioned above, type C is the one with which we are concerned today. One must bear in mind that the fistulous opening may be high or low or in between although most are said to occur 1–5 cm. above the bifurcation of the trachea. The fistula may have the tracheal and esophageal openings opposite each other or the tracheal openings may be higher than the esophageal opening.

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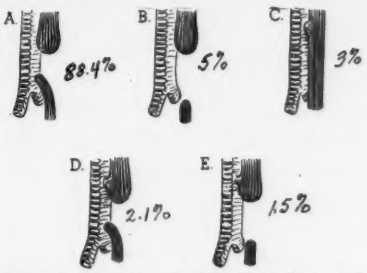

Fig. 481. Types of anomaly. *A*, Atresia of esophagus with fistula between distal esophageal segment and trachea. *B*, Atresia of esophagus without any fistulous connection with trachea. *C*, Tracheo-esophageal fistula without esophageal atresia. *D*, Atresia of esophagus with fistulae present between both the proximal and distal segments and the trachea. *E*, Atresia of the esophagus with fistula between proximal esophageal segment and trachea only.

FIG. 1

HISTORIC REVIEW

A brief review of the literature reveals that the majority of clinicians have encountered difficulties and delays in diagnosing this condition. Prior to 1917, Cautley[2] was able to find only 6 reported cases of tracheo-esophageal fistula without atresia. One case included in his report was that of Lamb, who in 1873 described the clinical course and post mortem findings in an infant 7 weeks of age. Lamb's paper was the first American article describing this condition. Imperatori[7], in 1939, was the first to make an exact preoperative diagnosis and to cure the patient by surgery. His fistula, which was seen by bronchoscopy, was high in the neck and was repaired through a cervical incision. In 1941, Gengenbach and Dobos[4] reported the post mortem findings in a 3 month old infant who had other serious congenital abnormalities in addition to the tracheo-esophageal fistula. These authors reported 2 other cases, neither of which was confirmed by post mortem or surgery. Haight[5], in 1948, described the clinical picture and findings at operation in a 4 year old child and was apparently the first to successfully close the fistula through the chest. He also reported the post mortem examination of a patient who died prior to corrective surgery. In 1950, Morton, Osborne, and Klassen[9] reported the unusual case of a 26 year old man whose fistula was considered congenital. In the same year, Cardullo and Berens[1] reported the findings in an infant who died on the fifth day of life. They discussed the difficulties in diagnosis. Also in 1950, Ferguson[3] presented 2 autopsied cases of tracheo-esophageal fistula without atresia of the esophagus. In 1951, Leigh, Abbott, and Hopkins[8] reported 2 cases of congenital esophageal fistula, 1 patient was successfully repaired and 1 died on the second postoperative day. Helmsworth and Pryles[6] also in 1951 reported a case of a patient who was explored through the chest successfully despite their inability to demonstrate a fistula roentgenographically or by bronchoscopy. In 1954, Ware and Cross[12] reported a case of a patient who was born on July 20, 1953. Review of their paper shows the difficulties and delay encountered in confirming the diagnosis. Despite their suspicion that an esophageal fistula was present, it required 6 weeks and 3 Lipiodal studies of the esophagus before it was conclusively demonstrated on September fourth. As late

as 1955, Pryles and Huvos[10] reported a case of a 4 day old female infant with negative roentgenologic demonstration of the fistula "in prone, supine and lateral positions." When doing an emergency tracheotomy on the nineteenth hospital day, the fistula was discovered but further surgery couldn't be done because of the infant's condition. She died on the twenty-fifth day of life. More recently in 1956, Stephens, Mustard and Simpson[11] reported 4 such anomalies out of 138 congenital tracheo-esophageal fistula cases. Three of these were in males. The first case was diagosed after death of the patient on the sixth day; the second infant died on the first postoperative day with the last 2 successfully surviving surgery.

As one can gather from many of these cases having been diagnosed only after weeks of delay or at post mortem instead of preoperatively, the diagnosis is not easy. It is the important demand for corroborative roentgenologic evidence in the face of highly suggested clinical findings that has apparently been responsible for the delays in diagnosis. It is hoped that, with the use of the technic mentioned below, the diagnosis and exact location of the fistula can be confirmed roentgenologically in all cases earlier and prior to surgery or post mortem examination.

CASE REPORT

Baby M. J., aged 6 weeks, was first seen in the Pediatric Department of The Medical Center Clinic on Feb. 4, 1952. The history was that of a normal birth of a white male who weighed 9 pounds and 14 ounces. Although the child had a cough with vomiting while in the nursery, he was allowed to go home with his mother on the fourth day after birth. The mother reported that several times the baby became blue after eating but never was he in sufficient difficulty to force rehospitalization. Several changes in formula and medications gave no improvement but the nutrition suffered suprisingly little as the child weighed 8 pounds and 4 ounces when first seen 6 weeks later, or a loss since birth of only 1 pound 10 ounces.

The father's description of the difficulty was as follows: "The baby would take 3 or 4 swallows without trouble then he would cough and vomit. Following this, he would take 2 or 3 ounces of his formula without further trouble." Examination revealed a fairly well developed and nourished infant in no distress. He had not eaten for 3 hours prior to the examination and his chest was clear. However, after feeding with glucose water, the sequence mentioned by the father occurred, following which the chest showed widespread coarse rales.

It was thought that some anomalous connection between the esophagus and the trachea was present. As fluoroscopic swallows of Lipiodol revealed little except a patchy pneumonitis, the child was admitted to the hospital for further work-up. The day after admission, a small regular catheter was passed into the esophagus and fluoroscopy and roentgenologic study with Lipiodol with the baby supine, lateral and prone was negative except that after vomiting some of the iodized oil was found in the mouth, trachea and bronchial tree. Whether this was aspirated or not could not be determined. No fistula was seen.

On February 6, esophagoscopy was done and reported as normal. No bronchoscopy was done. Tube feedings were decided upon but despite this at times the baby would cough and vomit.

On February 9, still another roentgenologic study was decided upon but in place of using a regular catheter a balloon catheter was to be used to get the radiopaque dye into the esophagus. A number 16 Foley catheter was therefore employed inflating the balloon with lipiodol rather than air or water, so that its location and size could be determined fluoroscopically. The examination was begun with the balloon inflated at the lower third of the

FIG. 2

esophagus and a small amount of oil instilled through the catheter into the lower esophagus. As no fistula was seen, the balloon was then deflated partially and withdrawn to a slightly higher level and an additional small quantity of iodized oil instilled. This maneuver was repeated until oil appeared in the bronchial tree.

We knew then that the fistula was present as no oil was able to bypass the inflated balloon and be aspirated. We knew that the location of the fistula was just distal to the balloon. The catheter was permitted to remain at this level and several spot films were made in various projections while injecting the opaque oil. For clinical research reasons, the procedure was repeated 4 days later with even better results (fig. 2).

With the roentgenograms showing the exact location and size of the fistula, as portrayed on the slides, surgery was, of course, necessary. Since the fistula was high, a short incision was made along the anterior border of the left sternocleidomastoid muscle, although the usual low collar or transverse cervical incision could just as well have been made. The incision was deepened until the carotid sheath was identified. The inferior thyroid vein was clamped and cut and the left thyroid lobe was retracted medially. The carotid sheath with the artery, vagus nerve and internal jugular vein were retracted laterally. The trachea was identified and the fistulous tract extending to the esophagus was located and transected. The tracheal opening was closed with mattress sutures of no. 0000 black silk. The esophageal opening, which was lower than the tracheal opening, was similarly closed. A second layer of sutures was inserted through the muscularis layer for inversion and reinforcement. Postoperatively the infant's convalescence was uneventful and he was rapidly put on a diet for his age. There has been no subsequent difficulty.

DISCUSSION

Signs and symptoms associated with congenital tracheo-esophageal fistula without atresia may be inconsistent and variable and often may stimulate those of faulty neuromuscular coordination of the act of deglutition. Coughing and choking, and at times severe dyspnea and cyanosis coincident with ingestion of liquids is noticeable and will vary inversely with the viscosity of the feeding. The clinician may find that the chest is clear before a feeding but after the ad-

ministration of a low viscosity liquid, breath sounds will be accentuated. A chronic wet cough and recurring pneumonitis of an unexplained nature heard by the clinician or seen on chest roentgenograms should make one suspicious that this condition is present. Others[6, 12] have reported an abnormal gaseous distention of the abdomen. This is thought to be due to tracheal air entering the esophagus and being swallowed. After coughing, the amount of air appears greater roentgenologically in the stomach than before. Weight gain may be slow or weight loss may be gradual and negligible, but in all cases will vary with the severity of the symptoms produced on feeding. Tube feedings usually will stop the symptom complex although not always, as in this case. Other points to remember are that this condition is most likely to occur in the male and about approximately one-fourth will have prematurity and/or other serious associated congenital abnormalities.

The diagnosis will be made only if the clinician has a high index of suspicion from an adequate history and physical examination. To confirm this suspicion, a roentgenologic study of the esophagus should be done. Anomalies of the esophagus present no problem to the roentgenologist where an atresia or marked stenosis is present. However, minor variations from the normal, such as tracheo-esophageal fistula without atresia, have been far more difficult to demonstrate satisfactorily. Barium should not be used when this condition is suspected, but preferably Lipiodol, Diadrast, or Dionosil. As these fistulas arise from the anterior wall of the esophagus the baby should be prone during the examination to allow gravity to assist the opaque medium into the tract. Even with this precaution in the past, it has been significant that failure to demonstrate the fistula has occurred more frequently than hoped. It is essential, whenever possible, that every attempt be made to provide the surgeon with the exact preoperative information as to the location and extent of the fistula.

In this particular case, preliminary attempts to demonstrate the clinically suspected fistula were unsuccessful, although installation of the opaque material into the esophagus with the baby prone using a regular catheter did show some of the dye in the bronchial tree. It is impossible, however, to determine the exact level of the communication or to be certain that the dye was not regurgitated and then aspirated. However, when the Lipiodol appeared in the bronchial tree with the Foley bag catheter in place, we knew that a fistula was present and aspiration was not a factor. Second, with this method the esophagus with its marked elasticity can be distended somewhat and the folds decreased perhaps sufficiently to open up a small fistulous tract which may otherwise escape detection. Finally, the radiopaque dye can be retained longer and concentrated more for spot films in the area of the suspected fistula if the Foley bag is used. These films the surgeon will appreciate. It is believed that the roentgenological study of the esophagus, in the fashion outlined above, will provide a simple and more accurate method of detecting the presence and location of the tracheo-esophageal fistula when no atresia is present.

Reports from others[12] seem to indicate that bronchoscopy and esophagoscopy often are technically most difficult and unrevealing and not without hazard. We

believe that the balloon catheter method outlined above should be employed before these diagnostic procedures. The same would apply to the tracheogram. With our limited experience, we are not prepared to say that one negative study is conclusive.

SUMMARY

Congenital tracheo-esophageal fistula without atresia of the esophagus is a rare anomaly. The literature is reviewed and a case of a high fistula, apparently the second to be reported successfully repaired, is presented.

The roentgenologic demonstration of the fistula is most important if the surgeon is to be provided adequate preoperative information as to its exact location and extent. A new method for this study is outlined.

Surgery is indicated for cure.

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CONGENITAL GOITER: REPORT OF TWO CASES*

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Congenital goiter is of sufficient rarity in this section of the country to warrant the reporting of the 2 following cases. The number of cases reported in which the patients had surgical intervention is extremely rare, and, up to 1950, Jones[5] reported a total of only 11 cases with pathologic study. Hellwig[3] wrote that he had never seen a congenital goiter in this country, but that he had seen many in Frieberg, on the border of the Swiss endemic goiter region. Bernhard and associates[1], writing in a more recent journal, collected only 6 cases from the literature in which the patients had been treated surgically in North America. Schifrin and Hurwitt[11] reported a list of 9 cases in which the patients had undergone surgery.

The definite cause of congenital goiter is not known; but it has been shown that if the mother takes a small dose of iodine at intervals, during gestation, the baby will probably not be born with a goiter. Crile[2] recommended that a tablet containing 10 milligrams of iodine be taken once a week or 1 minim of 25 per cent solution of potassium iodide be substituted for the former. It has been shown, however, that iodine will not always prevent the occurrence of congenital goiter. The mother of the patient in a case reported by Bernhard and associates[1] was slightly thyrotoxic, and had taken iodine the last 7 months of gestation. They thought that the cause of the failure of the medication, might have been due to poor assimilation of the iodine or some defect in its cellular metabolism. It is usually thought that most congenital goiters will gradually become smaller if the baby survives the early days of life. Iodine therapy may be used to accelerate the regression of the mass.

The main reason for surgical intervention is to relieve any strangulation which the goiter mass might produce. Schifrin and Hurwitt[11], reported 1 case in which the patient was operated upon, and then later, 3 months after surgery, the patient developed a large tongue and symptoms of hypothyroidism. The infant was given thyroid replacement therapy and definitely improved. From this report it would seem wise to determine definitely what the mass is, and do only a subtotal thyroidectomy. This was considered in the surgical treatment of the case being presented.

It has been shown that the administration of thiouracil[10] and propylthiouracil[13] to the mother may cause goiter in the newborn. These goiters usually do not produce symptoms and gradually disappear spontaneously. The administration of thyroid hormone may help in the treatment of such goiters. In 1 case[13] reported, the infant was euthyroid, clinically, and had a normal protein bound iodine although the radio-iodine uptake was markedly increased.

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Kriss and associates[7] did considerable study on the production of hyperplasia of the thyroid in relation to the treatment of anemia with cobaltous chloride. They concluded that cobalt was a goitrogenic agent, and thought that its indiscriminate use, especially in infants and children, should be avoided. On the other hand, Klinck[6] reviewed reports of 10 cases received at the Armed Forces Institute of Pathology, and found that 5 children received cobaltous chloride and ferrous sulfate. He thought that the goitrogenic activity of cobalt could not be established on a small number of cases, and that further study was necessary. Holly[4] observed 78 pregnant women. Fifty-eight received cobalt and iron and 20 received cobalt alone. He stated that all children resulting from these pregnancies were normal. He concluded that the administration of cobalt or cobalt and iron to pregnant women did not result in goiter formation. Robey and associates[9] recently reported a case of cobalt induced myxedema in a 17 month old girl, and they concluded that cobalt appeared to have a goitrogenic effect in a certain percentage of patients.

It should be kept in mind that congenital goiters may also be adenomatous and may develop into adenocarcinoma. One such case was reported by Stevens and Waite[12]. They reported the case of a 7 year old girl who had had a lump in her neck since birth. It did not increase in size, although her voice was a little husky. At operation, a Grade II adenocarcinoma was found. The report was made 2 years after operation, and the child was well. It was concluded that the adenocarcinoma had developed from simple adenomatous tissue. McClintock and Sewell[8] emphasize the fact that malignant thyroid neoplasms in children are being reported with increasing frequency.

A few comments should be made concerning the surgical technic of thyroidectomy in the infant. With intratracheal anesthesia, the infant can be carried along during the procedure very well. In this particular case, the color of the patient was much better during surgery when it was getting ample oxygen, than prior to surgery. This was because the patient had a congenital heart disease with cyanosis at the time of surgery. Particular care should be given to hemostasis because of the marked pressure in the neck vessels when the patient cries following surgery.

Case 1., D. F. (fig. 1) was born Oct. 28, 1955, weighing 5 pounds, 8 ounces at birth. She was the fourth child of the family. One of us (J. G. L.) was first consulted in December, 1955 with the complaint of intermittent attacks of cyanosis since birth that had become readily more pronounced since the age of 3 weeks. Since the baby was about 1 week of age, the mother had noted a swelling in her neck. The baby had been born following a relatively normal pregnancy, marked only by pyelonephritis in the sixth month of gestation. The mother had received no medication during the pregnancy, and stated that she felt perfectly well. The baby received no goitrogenic drugs, such as cobalt. There was no family history of congenital heart disease, and a brother, (M. F.) had a goiter. Two other children were perfectly normal.

Physical examination revealed a small extremely irritable baby. There was a permanent cyanosis of the nailbeds and face. The skin was moist, the tongue was normal in size. There was no umbilical hernia. There was a large mass in the neck, bilaterally. The heart was not enlarged, but there was a loud pulmonic systolic murmur. Significant laboratory studies were a protein-bound iodine of 4.2, and x-ray findings of a normal sized heart, showing

FIG. 1. D. F. prior to surgery

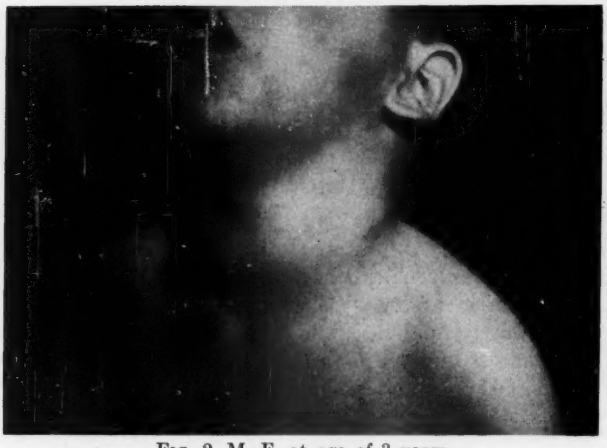

FIG. 2. M. F. at age of 3 years

apparently increased aeration of the lungs, and a concavity in the region of the pulmonic conus segment. There was a questionable enlargement of the right ventricle. It was thought that the mass in the neck was causing some definite respiratory embarassment.

With a working diagnosis of goiter and congenital heart disease, probably Tetralogy of Fallot, the neck was explored (by W. G. C.) and a right subtotal thyroidectomy was done, Jan. 18, 1956. The left side was later done, on February 21. The pathologic report was hyperplasia of the thyroid, nonspecific (figs. 3 and 4). Following surgery it was thought that the baby did breathe better, but she continued to do poorly and to go down-hill. In June 1956, a Pott's Operation was performed by Doctor Alfred M. Tocker, the baby withstood the procedure very well, and has continued to do fairly well.

Case 2. M. F. (fig. 2), brother of the above patient, was the second child in the family of 4. The mother had noted a goiter in the first few months after birth. Apparently the goiter had grown at the same relative rate as the child. When this patient was first seen by (J. G. L.) in March 1956, he was 3 years old, 36 inches tall, and weighed 30 pounds. His

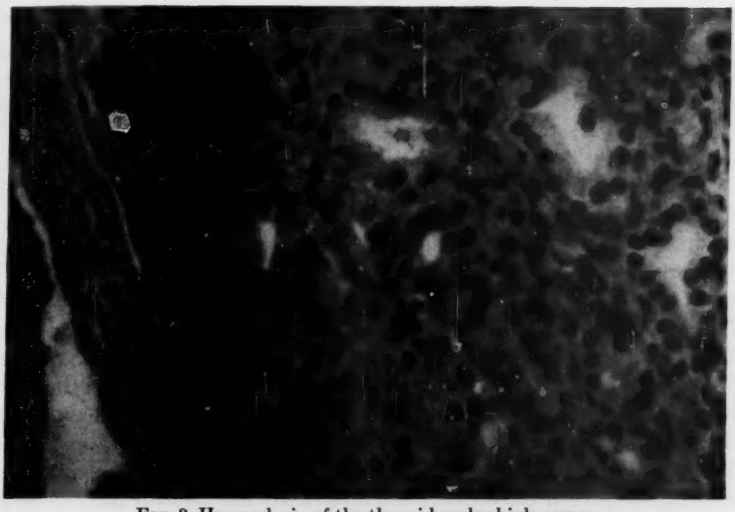

FIG. 3. Hyperplasia of the thyroid under high power

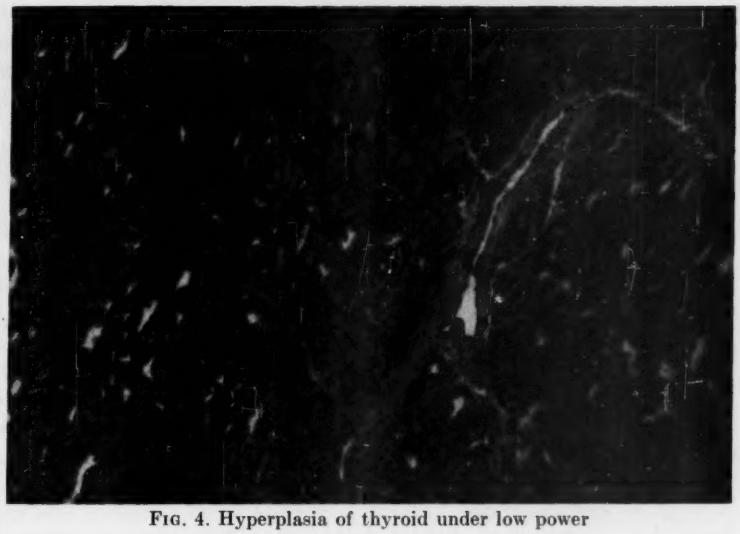

FIG. 4. Hyperplasia of thyroid under low power

blood pressure was 80/50, the pulse 100; temp., 99.4° F degrees, rectally. He was normally active and showed no undue sensitivity to heat or cold. His growth and development had been satisfactory. He was alert, and friendly. The hair and skin were of normal texture and moisture. The tongue was normal in size. A moderate, rough systolic murmur was heard in the pulmonic area. The thyroid was diffusely enlarged, and there was no bruit. The protein-bound iodine was 5.1 micrograms per cent. The mother was examined by the family physician who reported that there was no evidence of thyroid disease, and that her basal metabolic rate was normal. The first and third child of the family had no cardiac or thyroid manifestations.

Additional Note: Since the above article was sent in for publication, M. F. (fig. 2) developed some difficulty in swallowing. The goiter enlarged and there was a questionable nodule in the right upper lobe. His protein bound iodine was normal. On November 5, 1957, he was taken to surgery and a subtotal thyroidectomy was done. His convalescence was quite satisfactory.

Microscopically the thyroid revealed small acini, many of which were empty and surrounded by rather dense bands of connective tissue. There was no evidence of malignancy and no follicle formation was observed.

It is interesting to note the difference in pathology of these two cases.

SUMMARY

This is the report of a family in which 2 of the 4 children have a congenital goiter and evidence of congenital heart disease. The other 2 children are apparently perfectly normal. There is no evidence of any abnormality in the parents. Neither the afflicted children or the mother had received cobalt or any goitrogenic agent.

A general discussion of congenital goiter is presented, and the rarity of the disease in this part of the country is emphasized. The number of patients going to surgery has been very few. The literature on the surgical treatment is discussed. Two cases from one family are presented—one child has been treated surgically and the other medically. The cause of congenital goiter is not known definitely; but the role of goitrogenic drugs is discussed. In the 2 cases presented, there was no evidence that either the children or the mother had taken any kind of medication.

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PENETRATING WOUNDS OF THE ABDOMEN*

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INTRODUCTION

This presentation is an analysis of all penetrating abdominal wounds which were operated upon at the Robert B. Green Memorial Hospital, San Antonio, Texas, in a 6 year period from July 1, 1950, through June 30, 1956. A total of 311 patients were operated upon during this period.

This hospital is a County-City operated charity hospital staffed by private practicing physicians in the city, and is under the postgraduate division of the University of Texas Medical School. The surgical service has a 3 year residency training program approved by the American Board of Surgery. These operations were performed either by the attending staff or the house staff, under supervision of the attending staff. The house staff actually performed the greater majority of the procedures. The bed capacity of the hospital has varied from 225 beds in 1950, to 325 beds in 1956. The population of San Antonio, according to the 1956 census, is 534,015.

ANALYSIS OF SEX, AGE, AND RACIAL DISTRIBUTION

An analysis of the number of cases per year together with the incidence according to sex, age, and racial groups, is projected in table 1. Total number of cases was 311, with the lowest annual occurrence being 39 in the period 1950–51, with a maximum of 61 cases in the year 1954–55. The lowest incidence during that period was due to enlargement and renovation of the physical plant.

In the analysis of sex distribution, no striking deductions can be made. The incidence of male predominance is as one would expect.

The age incidence is divided into the youngest, median, and oldest ages involved. The youngest recorded case was that of a child 1 year of age. The average age of the youngest group was 10.3 years. The average median age group was 18.8 years, which revealed that most cases occurred in young adolescents. The adolescent Latin American represents the major part of our juvenile delinquency problem in our city. The oldest age recorded was 53 years. The racial proportion of our city as regards Latin Americans, Negroes, and Anglo-Americans, is: Latin American, 39.3 per cent, Negroes, 7.0 per cent, Anglo-Americans 53.5 per cent. This would indicate that the incidence of penetrating wounds of the abdomen is much higher in the Latin American lower income group, than in the corresponding Negro and Anglo-American groups.

* From the Surgical Service of the Robert B. Green Memorial Hospital, San Antonio, Texas.

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TABLE 1

Sex, age, racial distribution

Period & No. Cases	Sex		Age Groups			Races		
	Male	Female	Young	Median	Old	Latin	Negro	Anglo
1950–51 (39)	36	3	5	20	48	33	2	4
1951–52 (51)	49	2	16	22	57	41	6	4
1952–53 (53)	44	9	1	17	63	38	9	6
1953–54 (55)	50	5	15	20	56	33	17	5
1954–55 (61)	55	6	13	17	58	54	5	2
1955–56 (52)	47	5	12	17	55	43	8	1
Average	—	—	10.3	18.8	56.1	—	—	—
Totals (311)	281	30	—	—	—	242	47	22
Percentage	90.4	9.6	—	—	—	77.8	15.1	7.1

ANALYSIS OF WOUNDS, INCISIONS, ANESTHESIA, AND BLOOD REQUIREMENTS

Of our 311 total wounds, 243 or 78.3 per cent were due to stab wounds with sharp missiles; 64, or 20.5 per cent of wounds were due to gunshot, involving pistols, rifles, shotguns, and other firearms (table 2). In the total group of cases there were 4, or 1.3 per cent wounds from miscellaneous agents.

In the types of incisions employed no attempt has been made to influence the surgeons in choice of incisions, except to stress that an incision should be one that offers adequate exposure of the abdomen, so that complete and thorough exploration can be carried out. It should also be one that can be readily enlarged to meet possible needs for more adequate exposure.

The anesthesia of choice is believed to be intratracheal general anesthesia. Cyclopropane with high oxygen concentration is preferred. The relaxants of the curari derivatives have been used, but this has been left to the discretion of the anesthesia department. In an analysis of our anesthetics employed, it is found in the period of 1950–52, that the usage of spinal anesthesia was much higher than at the latter part of the series. In the last 2 years no spinal anesthesia was employed. This can be explained readily by the fact that a department of anesthesiology was instituted under the direction of 2 physician anesthesiologists, using supplemental nurse anesthesiologists. Prior to this time only nurse anesthetists were available, and members of the house staff were frequently employed to give anesthesia. In general, it is thought that spinal anesthesia has no place in the exploration of the abdomen for penetrating wounds unless local conditions preclude the use of safe intratracheal general anesthesia.

The place of adequate blood replacement in the management of penetrating wounds of the abdomen cannot be overemphasized. Blood, in our institution is supplied by the Southwest Blood Bank, which renders excellent service. Some blood loss is always present and severe blood loss can be expected. The degree of bleeding depends on the types of wounds and the areas involved. Blood used in 500 cc. units is presented in table 2, showing total amount used per year, and

TABLE 2

Analysis of wounds, incisions, anesthesia and blood use

Period & No. Cases	Wounds			Incisions		Anesthesia		Blood Units	
	Stab	G.S.W.	Misc.	Trans.	Vert.	Spinal	General	Total	Average
1950–51 (39)	27	11	1	14	25	18	21	105	2.7
1951–52 (51)	43	8	0	37	14	10	31	125	2.5
1952–53 (53)	41	11	2	30	23	1	50	156	2.9
1953–54 (55)	40	15	0	40	15	1	54	195	3.54
1954–55 (61)	48	13	0	30	31	0	61	186	3.04
1955–56 (52)	43	8	1	26	25	0	52	124	2.3
Totals (311)	243	64	4	177	134	30	269	891	2.83
Percentage	78.1	20.6	1.3	56.9	43.1	9.6	90.4	—	—

average amounts per case. A total of 891 units were used for the 311 patients with an average of 2.83 units (or 1,415 cc.) per patient.

ANALYSIS OF VISCERAL WOUNDS

A. Wounds of Hollow Viscera (table 3)

The gallbladder was injured 9 times, an incidence of 2.9 per cent. In 7 instances a cholecystostomy was performed, and in the remaining 2 a cholecystectomy was carried out. These wounds offered no particular difficulties. Injury of the major bile ducts was not encountered.

There were 40 wounds of the stomach, an incidence of 12.5 per cent. In most instances, only simple closure and continued nasogastric suction was required. Wounds of the stomach were frequent, and emphasis should be made on careful exploration of the stomach. Mobilization, by division of the gastrocolic ligament, to offer more thorough visualization and examination of the posterior wall, as well as the greater and lesser curvature of the stomach, should be stressed. The main hazard in stomach wounds is overlooking a perforation. There were 4 deaths in our 40 cases of stomach wounds. All these deaths were associated with injuries of other organs; except in one instance, where only the stomach was involved. In this latter case a perforation was overlooked, on the posterior wall, with the patient dying of hemorrhage.

The duodenum was wounded in 17 cases, an incidence of 5.4 per cent. These wounds are listed separately from the remaining portion of the intestine, since it is thought that duodenal wounds deserve separate consideration. Of this group (17 cases) there was only one death recorded, which was due to a perforation in the second portion of the duodenum being overlooked. Great care should be exercised to rule out any perforation of the duodenum, as these wounds are always lethal if not properly cared for. Where there is doubt as to involvement of the duodenum, particularly in the presence of a large retroperitoneal hematoma in this area, the safest procedure is adequate exploration. This is best done by reflection of the duodenum, and by division of the right lateral peritoneal reflec-

TABLE 3

Wounds of hollow viscera

Period & No. Cases	G. Bladder	Stomach	Duodenum	Intestine	Colon	Vascular	Urinary
1950–51 (39)	2	8	3	9	13	1	4
1951–52 (51)	1	9	2	8	4	1	4
1952–53 (53)	0	7	4	11	8	1	5
1953–54 (55)	1	7	3	8	3	2	6
1954–55 (61)	4	4	1	8	9	4	3
1955–56 (52)	1	5	3	9	7	3	3
Totals (311)	9	40	17	53	44	12	25
Percentage	2.9	12.6	5.5	17.0	14.1	3.8	8.0

tion, so that complete visualization can be obtained. Careful suture and adequate drainage should be employed.

Wounds of the small intestine, (exclusive of the duodenum and colon) offer the highest incidence of involvement in penetrating wounds of the abdomen, as one would expect. In our series 53 cases are recorded, an incidence of 17.0 per cent. Great care should be exercised in examining the entire extent of the small intestine from the suspensory ligament of Treitz to the ileocecal valve. Perforating wounds can be readily seen and repaired. They are routinely lethal if overlooked. Simple closure suffices in most instances. Resection and end to end anastomosis is recommended only where there is vascular damage to a segment of bowel, or where a great number of perforations occur in a short segment of bowel. There were 9 fatalities in this group. In only one instance was death due directly to a wound of the small bowel, and in this one instance, the cause of death was the result of a perforation being overlooked. Great care should be exercised in determining that each wound of entrance and exit has been found. If one is faced with an odd number of perforations, even greater care should be exercised to rule out the possibility of a perforation being overlooked. Perforations are usually of even number, with distinct and separate wounds of entrance and exit. Tangential wounds, however, can produce a single wound of entrance and exit. Intraperitoneal use of antibiotics has been used in most instances of contamination of the abdomen. Penicillin (plain) and streptomycin have been the most frequently employed of the antibiotics. One of our authors has recently reported several fatalities from the use of overdoses of Neomycin in the free peritoneal cavity. Antibiotics are frequently injected, through the wall, into the lumen of the intestine or colon. Parenteral administration of antibiotics by the intravenous or intramuscular route has been employed routinely in all patients.

Wounds of the colon are likewise quite frequent, 44 cases being found in this series of penetrating wounds of the abdomen, an incidence of 14.1 per cent. The principles described for management in perforations of the duodenum and small intestine apply even more stringently in the management of colon wounds. Various appendages of the colon frequently obscure wounds, so that great care

should be exercised to prevent the catastrophe of missing a perforation. Wounds along the mesocolic surfaces, the superior and inferior borders (in the transverse colon), and in the areas of the gastrocolic ligament and omental attachment are the most dangerous areas. Wound healing is not dependable in the colon due to its relatively poor vascular supply, combined, with thinness of its wall, and a great abundance of pathogenic organisms in its intralumenal contents. Primary suture of wounds in the unprepared colon is fraught with great danger. The mortality rate of primary suture of wounds of the colon, prior to the antibiotic era was prohibitive. With the use of antibiotics, primary suture of the unprepared colon, continues to be hazardous enough. In selected cases, in the hands of those endowed with good surgical judgment, this is perhaps permissible in some instances. However, in our hands, it is thought that exteriorization of all wounds of the colon is by far the safest procedure. This was emphasized to the senior author in his experience in World War II, and this procedure is the standard in the management of all colon wounds in our hospital. Exteriorization is accomplished when it can be done. In wounds of the low sigmoid and rectosigmoid colon and rectum, exteriorization cannot be accomplished, therefore proximal colostomy, to defunctionalize the colon, is carried out, with primary suture of the wound, and wide adequate drainage. Colostomy closure as a second operative procedure, with the bowel adequately prepared with antibiotics, is performed 4–8 weeks later. In our series 5 deaths occurred where the colon was involved, and in no instances was death attributable directly to colon wounds. All of these cases involved multiple viscera and death was attributed to causes other than the colon injury. Secondary closure of colostomies was accomplished without mortality.

Vascular wounds involving the greater vessels were recorded in 12 cases, an incidence of 3.9 per cent as shown in table 3. These wounds included, 5 lacerations of the vena cava; 5 injuries involving the iliac vessels, 3 arterial and 2 venous; and 2 instances of injury of the aorta and superior mesenteric artery. The latter required cross clamping of the aorta to arrest bleeding sufficiently to find and repair the bleeding site. There was one case of repair of injury of the external iliac artery by insertion of a homograft. Wounds of the great vessels are of grave concern and frequently the only indications of vascular injury are that the patient does not respond promptly to adequate antishock measures. Under such circumstances prompt laparotomy is advised, as frequently severe hemorrhage can be arrested and the patient's condition improved during the course of the operation, after the bleeding source has been controlled. Careful search, of the vessels of the mesentery of the small intestine, and colon; the vessels of the stomach; together with inspection of the liver and spleen, should be carried out. Retroperitoneal hematomas frequently indicate severe wounds of the vena cava, as well as the aorta. Pressure from hematomas may tamponade the vena cava to such an extent that bleeding is arrested, until the posterior peritoneum is opened. Exploration of the retroperitoneal areas, with inspection of the greater vessels is indicated in such instances. Mere ligation often suffices. Simple suture closure of perforations suffices in other instances. Care of extensive wounds can

be managed with homografts or prosthesis, where other measures are not feasible. The ready availability of such material is strongly advocated.

The urinary tract was wounded in 25 instances in our series, an incidence of 8.0 per cent. These have not been classified, but include all injuries involving the urinary tract. These wounds, in the main, were of the kidney and bladder. No recorded case of damage to the ureter was found. This bears out the experience of the Second Auxiliary Surgical Group in World War II where only 27 instances of damage of the ureter was recorded out of 3,154 cases of wounds of the abdomen, an incidence of 0.86 per cent. Wounds of the kidney are managed by preservation of kidney tissue where feasible, with adequate drainage. Where serious hemorrhage occurs and the kidney is badly damaged, nephrectomy is the treatment of choice, again with adequate drainage. Bladder wounds offer no particular problem, and when found are managed by simple closure and bladder decompression with indwelling urethral catheter of the Foley type. Adequate drainage of the space of Retzius is routinely employed.

B. Wounds of the Solid Viscera (table 4)

Wounds of the solid viscera include wounds involving the liver, spleen, and pancreas, along with those involving the mesentery and peritoneum. Wounds which have penetrated the peritoneum, but have not involved other important structures are designated by "peritoneum," which signifies penetration of the peritoneal cavity but without damage of any major structures.

In spite of the liver being protected by the lower rib cage, wounds of the liver are quite frequent, and 72, or 23.8 per cent were present in our series. Excellent coverage has been given injuries of the liver in recent articles by Madding[7], Sparkman[12, 13] DeBakey[3], and others. Briefly, our policy is that wounds of the liver offer two major problems, namely: leakage of bile, and hemorrhage. Adequate drainage of any liver wound, to offset bile peritonitis is mandatory. Hemorrhage, in many instances, may cease spontaneously due to normal clotting. In other instances, simple suture of lacerations may be readily accomplished. However, many wounds may be quite extensive, such as large stellate lacerations which require debridement followed by difficult closure or packing with coagulants, such as Oxycel or Fibrinfoam. A word of caution should be offered against the use of dry gauze packing. This method may offer an excellent means of arresting hemorrhage, at the time; but subsequent later removal of the packing may result in serious secondary hemorrhage, which may offer greater difficulty than the primary liver wound. Involvement of the liver is frequently encountered with wounds of other important organs. In 4 instances of wounds of the liver in our series of 72, there were 4 deaths, 2 associated with other major organ injury involving, in both, the pancreas and kidney. The cause of death in 1 of these 2 patients was due to shock, and the other from massive gastric hemorrhage on the ninth postoperative day. The 2 remaining patients of the 4 deaths were instances involving lacerations of the vena cava, both of whom died of hemorrhage and shock.

The spleen, likewise, is in a sheltered portion of the body. This, together with

TABLE 4

Wounds of solid viscera and peritoneum (negative explorations)

Period & No. Cases	Liver	Spleen	Pancreas	Mesentery	Peritoneum
1950–51 (39)	6	1	2	1	11
1951–52 (51)	14	0	1	9	12
1952–53 (53)	10	2	1	7	20
1953–54 (55)	21	2	3	12	13
1954–55 (61)	10	4	2	6	21
1955–56 (52)	11	8	3	3	18
Totals (311)	72	17	12	38	95
Percentage	23.8	5.5	3.8	12.2	30.5

its relatively small size, makes it less vulnerable to penetrating wounds of the abdomen than other organs. It is perhaps more vulnerable to blunt trauma than to penetrations. There were 17 instances of spleen wounds in this series, an incidence of 5.5 per cent, (table 4). Management comprised removal of the spleen. Suture of the spleen is entirely unsatisfactory and impractical, as well as dangerous. Serious hemorrhage can occur from any injury of the spleen. Caution should be exercised to rule out a wound of the spleen which may have ceased bleeding temporarily. Subcapsular hematoma with delayed rupture of the spleen is a well known phenomena. If there is any question of damage, splenectomy should be carried out.

The pancreas, likewise, is well sheltered, lying deep in the abdomen, anterior to the vertebral column, and protected by the costal arches. It is rarely reached by ordinary stab wounds, therefore gunshot wounds are the most frequent sources of wounds of the pancreas. There were 12 wounds of the pancreas in our series, an incidence of 3.8 per cent. There were 2 deaths in these 12 wounds of the pancreas. Both deaths were accompanied by injuries of other viscera. In one, the liver and right kidney were also involved. The cause of death was irreversible shock, occurring within 1½ hours after operation. The second involved the stomach, liver, and left kidney as well. The patient died on the ninth postoperative day, of pulmonary edema and massive gastric hemorrhage. Injuries of the tail of the pancreas should be treated by resection and suture as well as adequate drainage. Injuries, of other areas, should be handled by adequate drainage with approximation of the wound, where feasible, with sutures. Injuries of the major pancreatic ducts are best handled by ligation of the duct, or conceivably in some instance with anastomosis over a small T tube as advised by Priestly. Acute pancreatitis and peripancreatic cyst, are dangers that exist following any injury of the pancreas.

Many wounds of the abdomen traverse the mesentery of the intestinal tract. There were 38 instances of wounding of the mesentery recorded in our series with an incidence of 12.2 per cent. Wounds of the mesentery may produce division or laceration of arteries and veins, in the vascular arcades within the mesentery, with resultant severe hemorrhage. Interference of blood supply to the

corresponding segment of intestine may occur due to actual severance of the main blood supply, or due to compression of the vessels by an expanding hematoma within the leaves of the mesentery. Lacerations may be large enough to offer a potential source of internal herniation through theopening in the mesentery. Care should be exercised to ligate all bleeding vessels in the mesentery in order to arrest hemorrhage, and to prevent formation ofcompression of the vessels from subsequent expanding hematoma formation. Also, particular attention should be paid to the corresponding segment of bowel, and if viability is impaired, resection of that segment of the bowel with end to end anastomosis should be carried out. All openings in the mesentery should be carefully approximated to prevent further herniation of intestine through this area.

Believing that all penetrating wounds of the abdomen, usually, deserve thorough abdominal exploration, it is to be expected that a certain number of negative explorations will result. Our policy in penetrating wounds of the abdomen is "to look and be sure; rather than to stay out, speculate, and be sorry." There were 95 cases, or 30.5 per cent of our series, in which we encountered negative findings on explorations of penetrating wounds of the abdomen. There were no fatalities in the 95 cases of negative explorations.

ANALYSIS OF CAUSES OF DEATH

A review of our deaths, as reflected in table 5, reveals a total of 20 deaths in the series of 311 total patients operated upon, with an operative mortality rate of 6.4 per cent. In the 20 deaths, 14 occurred under 24 hours. In these 14 deaths, 11 deaths were due to uncontrollable hemorrhage and irreversible shock; one death was due to asphyxia from aspiration of vomitus, and 2 deaths resulted from cardiac arrest.

The 6 deaths occurring later than 24 hours, included one cardiac tamponade, in a complicated wound that involved the heart, and which was not suspected; one generalized peritonitis from a missed perforation in the second part of the duodenum; one drug reaction (Pontocaine) during a bronchoscopy. One death

TABLE 5

Analysis of deaths, as to time and wounding agent and complications

Period & No. Cases	Deaths		Deaths		Complications	
	Under 24 hrs.	Over 24 hrs.	Stab Wounds	G.S. Wounds	Major	Minor
1950–51 (39)	3	1	1	3	0	0
1951–52 (51)	2	2	3	1	3	3
1952–53 (53)	3	0	2	1	2	6
1953–54 (55)	0	2	0	2	4	4
1954–55 (61)	2	0	0	2	4	6
1955–56 (52)	3	1	0	4	5	0
Totals (311)	14	6	6	14	18	23
Percentage	4.5	1.9	1.9	4.5	5.8	7.4

occurred from a combination of pulmonary edema, pneumonia, and massive gastric hemorrhage.Cardiac failure accounted for one death, and pulmonary edema for the remaining death.

Analysis of deaths based on causative agents is also reflected in table 5. Six deaths, or 30 per cent occurred in stab wounds, 14 deaths, or 70 per cent, occurred in gunshot wounds, which emphasizes that gunshot wounds are of much more serious consequences than stab wounds. Major and minor complications are tabulated in table 5. Major complications included intestinal obstruction, embolism, wound disruptions, and intraperitoneal abscesses. Minor complications included wound infections, atelectasis, and adynamic ileus, temporary postoperative ileus, etc.

SUMMARY

Detailed analysis is made of 311 penetrating abdominal wounds occurring at the Robert B. Green Memorial Hospital, San Antonio, Texas from July 1950 through June 1956. An operative mortality of 6.4 per cent occurred. The causes of death are discussed.

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SURGICAL TREATMENT OF CONGENITAL TORTICOLLIS

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Many infants with congenital torticollis are observed at birth or are brought to physicians for evaluation as early as 2 weeks of age. They characteristically tilt their heads toward the affected side, and their faces toward the opposite side. This deformity and a disproportionately large sternomastoid tumor greatly worry the parents and obviate some form of treatment or reassurance by the physician.

Reports on two 6 week old female cousins illustrate some typical findings in infants with congenital torticollis in which surgical correction is indicated.

CASE REPORT

Case 1, M. M.: The mother first noticed a "tumor" on the right side of the neck when the infant was 14 days old. Her pregnancy and labor had been normal, and the child had been delivered with forceps. As the tumor continued to grow, the mother noticed that the infant choked and began having difficulty breathing. These symptoms progressively increased. Physical examination showed a 2–3 cm. firm mass in the middle of the right sternomastoid muscle. Lateral rotation of the head to the right was considerably limited. Such rotation was accompanied by respiratory difficulty.

Case 2. S. H.: This second mother also noticed a "tumor" on the right side of the neck when the child was 14 days of age. Her labor had taken 24 hours, and the infant had been delivered by forceps. Besides the enlarging tumor, the mother noticed that the head was becoming increasingly drawn toward the affected right side. On physical examination a firm, nontender, 2 cm. mass was found fixed to the right sternomastoid muscle. The head was laterally flexed to the right. Lateral rotation of the head was limited to 30 degrees to the right and 90 degrees to the left.

Both infants were surgically treated. The tumors and both right sternomastoid muscles were resected. No splints or casts were used after surgery. Except for a slight upper respiratory infection in the first infant, their postoperative courses were uneventful. Unrestricted lateral head motion to both sides was immediately observed. Followup of both infants showed full range of head motion and no asymmetrical changes of the head or face.

PATHOGENESIS

The numerous etiologic concepts of congenital torticollis that have been proposed are well summarized by Hulbert.[10] Several authors[1, 5, 7, 10, 11, 12] have recently reported a high incidence of difficult deliveries or breech presentations in infants with torticollis. Possibly, then, the fibrosis of the sternomastoid muscle is the end result of some vascular impairment instigated by a mechanical force before or during parturition, and the "tumor" is merely a manifestation of the disease.

PATHOLOGY

A tumor of the sternomastoid muscle is a tumor in the broad sense. It usually presents as a fusiform swelling involving a part or almost the entire muscle. Its

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cut surface appears smooth, dense, and cartilaginous. Microscopic sections show interlacing strands of dense, fibrous, connective tissue and muscle fibers. These muscle fibers may represent various stages of degeneration with loss of nuclei and striation (fig. 1).

TREATMENT

Treatment of infants with congenital torticollis is directed toward correcting the contracture with good cosmetic results as well as preventing permanent deformities. Untreated infants with a torticollis deformity may later develop permanent asymmetrical changes of the face and cranium. Conservative measures of treatment include exercises, overcorrective manipulations, braces, and casts. These measures are often successful in infants with a mild case of torticollis. Some physicians are justifiably reluctant to recommend surgical correction.

In many infants with a small tumor and transient torticollis, the body completely absorbs the tumor, and the torticollis deformity disappears. Unfortunately, unless very closely observed, many of these infants may later develop gradual asymmetrical changes of the face and head. While the criteria for surgically treating infants with torticollis are vague, the following conditions may be a guide: 1) progressive enlargement of the tumor, 2) increase in the torticollis deformity, and 3) beginning asymmetry of the face and head.

For many years several operative procedures have been used with varying degrees of success. Some procedures seem technically easy but are not without danger. Following are procedures that have been or are now being used to correct the deformity.

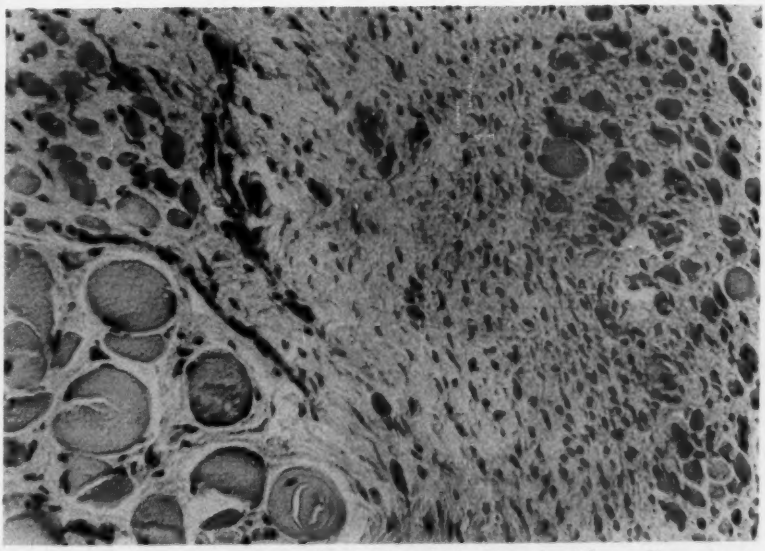

FIG. 1. Photomicrograph of tumor showing interlacing strands of dense, fibrous, connective tissue and degenerated muscle fibers. Normal muscle fibers are present in the lower left corner.

1. *Subcutaneous tenotomy*[9, 14] consists of blindly dividing the sternal and clavicular attachments of the sternomastoid muscle through a small supraclavicular incision. Although little or no skin scar results, division of the muscle may be incomplete and danger to the underlying structures is imminent. Many authors deplore this procedure.

2. *Method of Lange*[15] consists of dividing the muscle near its mastoid attachment with a posterior auricular incision, then overcorrecting the deformity with a cast. The chief disadvantage of this procedure is that the muscle may slide and cause traction on the spinal accessory nerve.

3. *Combined open tenotomy of the upper end and subcutaneous division of the lower end of the muscle* have been used with some success. The disadvantages of the subcutaneous portion of the procedure have previously been mentioned.

4. *Tenoplastic method of Foederl*[15] includes dividing the clavicular head of the muscle at its attachment and the sternal head near the middle third. The free clavicular head is then sutured to the distal sternal head. The transposition of the clavicular to the sternal head results in a lengthening of the entire muscle. However, if the muscle unites, it is a fibrous union in an already fibrous muscle.

5. *Open tenotomy*, probably the most widely used procedure, is advocated by Steindler[15] and many other orthopedic surgeons. The offernding head, or heads, of the sternomastoid muscle is divided at its attachment through a supraclavicular incision. Most orthopedic surgeons recommend a period of immobilization after this procedure. The infant may be placed in traction immediately after surgery. In a few days this is followed by a Minnerva jacket or similar cast with the head in an overcorrected position for an extended period of time. After the

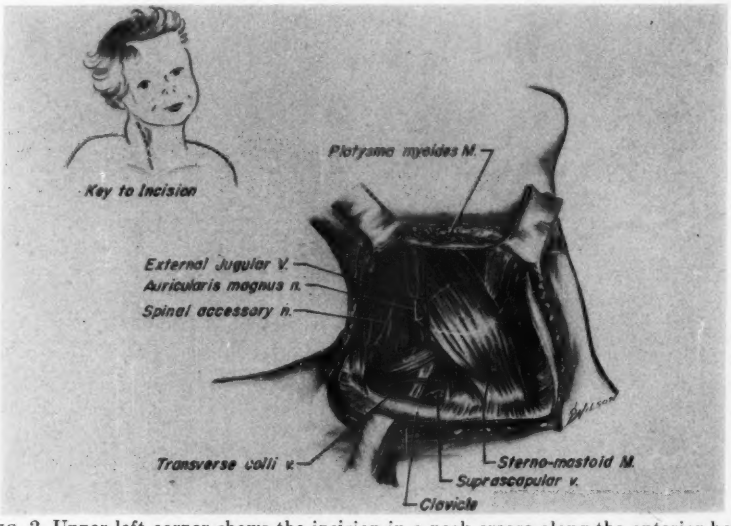

FIG. 2. Upper left corner shows the incision in a neck crease along the anterior border of the sternomastoid muscle. Lower right shows the exposed sternomastoid muscle and adjacent structures.

cast is removed the infant is given physiotherapy. Kiesewetter and associates[11] report satisfactory correction of the deformity with this procedure. However, according to Hulbert[10] the over-all cosmetic results were poor when he examined 12 patients 15 to 20 years later.

6. *Resection of the muscle* consists of resecting the tumor with the muscle. Chandler and Altenberg[5] report good results in a large series of infants with torticollis in whom the tumor was resected. Brown and McDowell[3] more recently report good results and suggest even a wider resection of the muscle than that recommended by Chandler and Altenberg.

Of the many surgical procedures, resection of the sternomastoid muscle has appeared to provide the best results with the least recurrences. In our limited experience we have had gratifying results by using a modification of the procedure described by Brown and McDowell. It is as follows:

After the patient is intubated by the anesthesiologist, the affected side is extended and draped. The incision is made in a neck crease along the anterior border of the sternomastoid muscle (fig. 2). After the subcutaneous tissue and platysma are incised, the fibrous sternomastoid muscle and tumor are readily seen. Both the sternal and clavicular heads of the muscle and their sheaths are divided at their corresponding attachments. Both heads of the muscle are grasped with a hemostat and delivered from the wound (fig. 3). By sharp and blunt dissection, the muscle and tumor are then separated from the underlying structures. The spinal accessory nerve and the anterior and internal jugular veins are located, isolated, and preserved during this phase. When the muscle with the contained tumor is separated from the underlying structures, it is divided near the mastoid insertion. After a careful search for bleeding points, a small

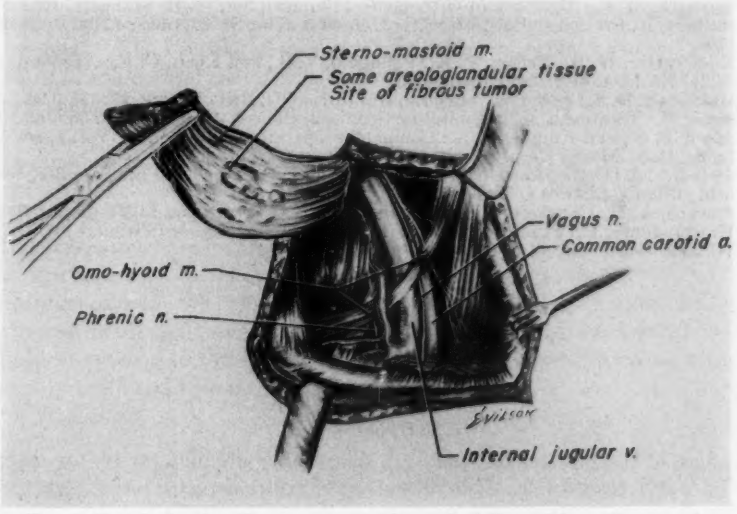

FIG. 3. Sketch showing the sternomastoid muscle delivered from the wound.

Penrose drain is brought out the lower aspect of the wound. The platysma and skin are then reapproximated with interrupted 000 plain catgut and silk respectively. A firm, nonconstricting curlex circular dressing is applied.

The drain is removed on or about the second day after operation. Traction or casts are not used when the muscle is resected.

CONCLUSIONS

Infants with congenital torticollis should be observed at frequent intervals. If the disease is progressing and asymmetrical changes of the face and head are beginning, surgical correction is indicated. Surgical operation may be done as early as 3 weeks of age. Judging from recent reports and our own experience, resection of the muscle gives gratifying results.

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PULMONARY ARTERIOVENOUS FISTULA

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The first description of congenital pulmonary arteriovenous fistula is attributed to Churton[4] in 1897. Since this description many others have reported isolated cases. A review of the literature reveals that most of the reported instances were adults who had lived long enough that the diagnosis might be made after thorough study. In infants, such as reported by Bowers[2], the 2 day old male died of hemothorax. At autopsy, hemangiomas of both lungs were disclosed. Reading[11], in 1932, described a 4 year old female child who suffered from cyanosis, weakness, and bruit in the chest. Death was due to brain abscess and again, at autopsy, multiple hemangiomas of the left lung were disclosed. Adults or young adults who have arteriovenous fistulas of a degree insufficient to interfere with life, live long enough to be thoroughly studied and perhaps cured by definitive surgery. Infants born with the serious defect of a by-pass in the pulmonary arteriovenous system, often are unable to cope with life long enough to enable the pediatricians, *et al.*, to make the diagnosis. Excision of the area of the lung involved is the treatment of choice.

The characteristic diagnostic signs are bruit on auscultation, mass of an indeterminate nature on roentgenogram of the chest, associated with polycythemia and an increased blood volume. Angiocardiography, if done, often reveals quite clearly the correct diagnosis.

Baer, and associates[1], have pointed out the necessity of differentiating this condition from congenital heart disease. The occurrence of cyanosis and clubbing of the finger nails, associated with dyspnea, often suggests a cardiac anomaly. Fainting, dizziness and convulsions may also occur. The presence of other visible skin or mucous telangiectasia may suggest the possibility of "hemangioma of the lung."

The familial tendency of this disease has been discussed by Moyer and Ackerman[10], Goldman[5] and Maier, and associates[9].

Hemoptysis and epistaxis are seen in the adults studied.

The association of polycythemia and an increased blood volume in the presence of an arteriovenous fistula is well known and adequately reported[7, 12, 13].

Roentgenograms will usually reveal an abnormal lung shadow. In young adults and infants fluoroscopy will not disclose an abnormal cardiac silhouette.

Surgical removal of the area of the lung involved allows a dramatic return to normal of the blood volume and the red cell count[3].

CASE PRESENTATION

Baby A. S., C. H. #C-101929: This 4 month old white male was admitted to the hospital in April 1954, with a history of failure to gain weight despite an adequate diet.

Presented during the Wichita Assembly of The Southwestern Surgical Congress, April 15–17, 1957, Wichita, Kansas.

Upon admission it was noted that the child was dyspneic and had an enlarged liver. Examination of the heart revealed a systolic murmur in the pulmonic area. Fluoroscopy of the heart revealed right ventricular hypertrophy (fig. 1). The child was debilitated and in serious condition. Catheterization of the heart or angiocardiography could not be done as the situation was deemed too hazardous. The child progressively became worse. Exploratory cardiotomy was advised.

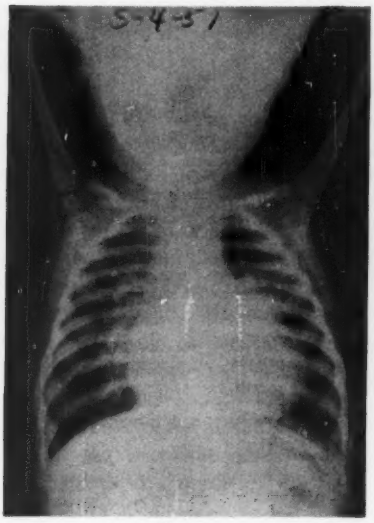

FIG. 1

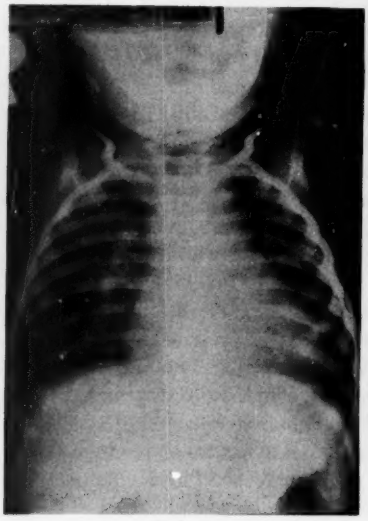

FIG. 2

FIG. 1. Fluoroscopy of the heart revealed right ventricular hypertrophy
FIG. 2. Same patient as figure 1. Two years postsurgical, doing well and has no murmur.

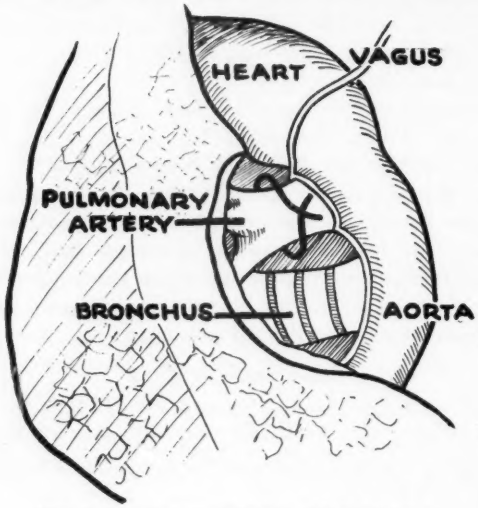

FIG. 3. Arteriovenous fistula of the left lung

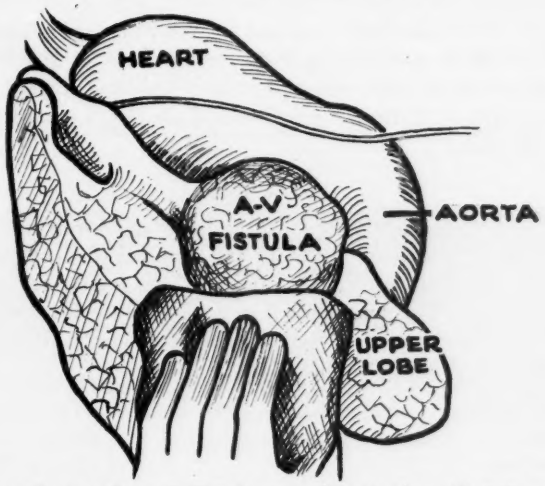

FIG. 4. Same patient as figure 3. Fistula arose directly above the left main pulmonary artery and left pulmonary vein.

At surgery an arteriovenous fistula of the left lung was found (fig. 3). The fistula arose directly above the left main pulmonary artery and left pulmonary vein (fig. 4). It was accompanied by the characteristic loud murmur and palpable bruit.

Because of the child's serious condition, a pneumonectomy was not advisable. Triple ligation of the left main pulmonary artery was accomplished. The bronchial arteries were not disturbed. Following this procedure the bruit disappeared and the arteriovenous fistula visually became smaller.

Recovery was uneventful. The child is now 2 years postsurgical, doing well, and has no murmur (fig. 2).

DISCUSSION

In 1954, Hultgren and Gerbode[5] adequately studied a 23 year old white male with this condition. This patient complained of dyspnea, cyanosis and weakness associated with fainting spells. Fistulous connections between pulmonary artery and vein were found in the left lower lobe of the lung. Resection of the lobe effected a cure. It was pointed out by the above authors that prior to resection cardiac output actually fell as a result of exercise. The oxygen consumption increased by 50 per cent.

In March of 1955, Gonlubol and Dimond[6] presented the cure of a 19 year old white male student at the Kansas University Medical Center. This case was adequately studied and beautifully presented, together with a discussion of the physiologic pattern involved. It was pointed out by them that an arteriovenous fistula differs from the characteristic fistula between an artery and vein, in that the shunt in these circumstances is between the low pressure pulmonary arterial bed and the equally low pressure of the pulmonary venous bed. The degree of the shunt, as in any arteriovenous fistula, depends upon the difference in pressure. The pressure difference is difficult to estimate, as one cannot determine adequately the gradient between the arterial and the venous sides.

In the instance here presented, time and the condition of the child precluded any adequate study. Surgery was advised on the basis of a cardiac anomaly and not the diagnosis of arteriovenous fistula of the lung. Ligation of the left main pulmonary artery changed the gradient of the shunt enough to allow the child to cope with life.

CONCLUSION

A 4 month old white male infant with a large arteriovenous fistula in the pulmonary circuit is presented. The child was terminal when operated upon. A pneumonectomy was inadvisable, but ligation of the pulmonary artery on the left was accomplished. This has resulted in good progress for the 2 years past. It is thought that the ligation of the left main pulmonary artery in this very seriously ill infant was perhaps a life saving measure.

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A NEW ANASTOMOTIC APPROACH TO RADICAL LEFT COLECTOMY: PRELIMINARY REPORT

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Under present day concepts of the procedure, radical left colectomy for both benign and malignant disease should involve wider mesenteric resection, longer resected colon lengths and, in many instances, high vascular ligation.[5, 2] Despite surgical advancement, certain factors still deter adoption of these. As Baker[1] has pointed out, anomalies of the middle colic vessels may interfere with mobilization of the hepatic flexure. With these anatomic variants, using a permanent colostomy is often necessary, even though a normal functioning anorectal canal with its sphincter mechanism is left intact. Reapproximation of the proximal and distal colon segments after resection still is a major factor, irrespective of the level of the lesion.

Interposition of small intestinal segments to restore continuity of the colon has been presented in the literature.[3, 4] More recently, transplantation of ileal segments has been revised as a bridging medium.[6] Mobilization of the vascular pedicles of these small bowel graft segments, likewise, presents a critical technical maneuver.

Recognizing these facts and the need for an improved procedure, we have studied a new anastomotic approach which allows unlimited resectability for lesions of the left colon. The method consists of anastomosing the terminal ileum to the proximal transverse colon and then anastomosing the cecum to the rectum (fig. 1). Using this approach, one could always do an en bloc resection of the left colon, similar in concept to present day radical right colectomy.

This preliminary report presents our study of 12 dogs in which we did such a procedure. It covers a total period of 16 months, in which the dogs were observed from 2 to 10 months after operation. Roentgenograms were made on these dogs at varied intervals, just before their being sacrificed. Postmortem examinations were then performed and the bowel specimens saved for photographs and microscopic examinations.

PROCEDURE

Adult mongrel dogs, whose weight averaged 10 to 25 kilograms were used for this study. The first 4 dogs were dewormed, but thereafter this step was dispensed with. Preliminary bowel preparation consisted of Panmycin (tetracycline phosphate—Upjohn) 250 milligrams every 12 hours for 5 days, and Mycrifradin (neomycin sulfate—Upjohn), ½ gram 4 times daily for 2 days, preoperatively. Food was withheld for 36 hours before surgery. The animals

From the Department of Surgery, McAlester Clinic, McAlester, Oklahoma.
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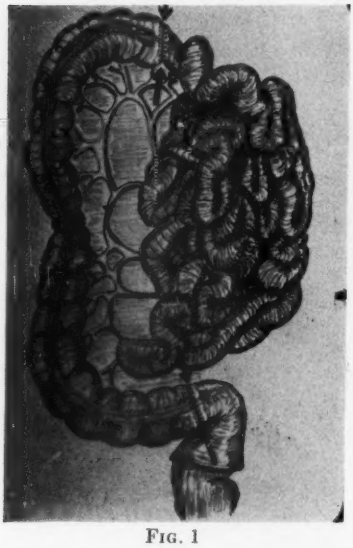

FIG. 1

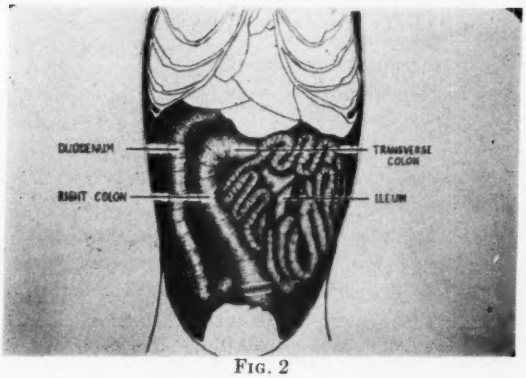

FIG. 2

were anesthetized with intravenous nembutal sodium, 60 milligrams for each 2 kilograms of body weight.

Our first group of animals was operated upon in October 1955. The operative procedure was as follows: A midline abdominal incision was made. The right colon was then transected just distal to the entrance of the terminal ileum. The cecal butt and adjacent terminal ileum were resected. The rectum was then transected at its junction with the rectosigmoid, and an end to end anastomosis was done between the proximal right colon and rectum. The entire left half of the colon was resected. The end of the distal ileum was then cut obliquely on its antimesenteric border, and an end to end anastomosis was formed between the terminal end of the ileum and the proximal half of the transverse colon. All

defects in the mesentery were closed, and then the abdomen was closed in routine fashion (fig. 2).

Postoperatively, all dogs were continued on Panmycin, 100 milligrams every 12 hours, intramuscularly, for 5 days. After operation diet consisted of full liquids for 2 days, then a rapidly progressing diet to full kennel rations.

After we determined that the flow of colon contents could be reversed, we used various anastomotic sites for the proximal anastomosis and left in different lengths of transverse and left colon. Schematic representation is shown in (fig. 3).

RESULTS

1. Postoperative Complications: There were 2 postoperative deaths in this group of 12 dogs. They were a direct result of a "blow out" of the distal suture line. The deaths were early in the series, when the suture technic used on this anastomosis was a double layer closure of interrupted gastrointestinal 00 silk. We found, however, that the interrupted suture technic was not satisfactory for this line of anastomosis because of the minimum strength in the serosa and longitudinal muscle layer of the dog's lower colon. Subsequently, we used a double layer closure of running 000 chromic catgut. With this technic, no further suture line perforations occurred.

2. Nutrition: All 10 surviving dogs maintained original body weight, and 4 of them gained weight. All showed an improvement in over-all nutrition on regular kennel rations, many having been undernourished before procurement. Their nutritional gain was evidenced by improved texture and shine of hair coat. All dogs were able to take full kennel rations with no digestive impairment within 6 days of operation.

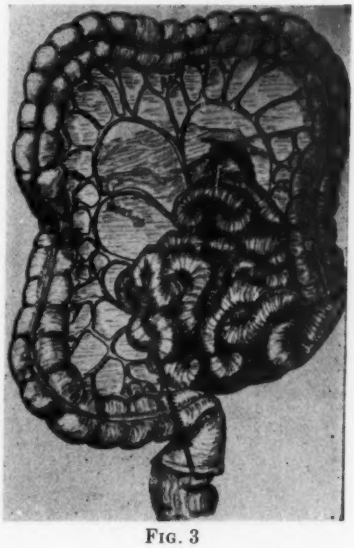

FIG. 3

3. Stool Habits: The dogs usually had no bowel movements for the first 24 hours. Then they had small liquid stools for from 5 to 10 days and soft stools after 2 to 3 weeks. Despite the varied lengths of left colon resected, the reversal of colon flow in all instances was satisfactory and appeared to make no change

FIG. 4

FIG. 5

in the stool habits. None of the dogs, however, showed resumption of hard formed feces.

4. Motor Function: Roentgenogram and fluoroscopy studies with barium and air contrast enemas were done on all dogs under anesthesia. These studies

FIG. 6

FIG. 7

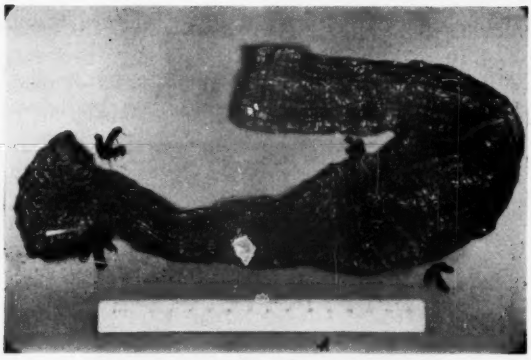

FIG. 8

revealed a normal passage of media through the rectum into the right and transverse colon and then into the terminal ileum. There was neither delay nor rapid propulsion of the media at any time. The unsacrificed dogs that were allowed to regain consciousness promptly expelled the barium enema material.

In the group sacrificed within 4 months of their original operation, there was moderate ballooning of the terminal ileum just proximal to the line of the proximal anastomosis (figs. 4 and 5).

In the dogs with longer follow-up periods, this dilatation of the small bowel was reduced considerably (figs. 6 and 7).

5. *Anatomic Changes:* The group observed longer than 4 months had a compensatory thickening of the muscular coats of the ileum. Grossly, the mucosal pattern of the ileum adjacent to the line of proximal anastomoses became similar in appearance to that of tranverse colon (fig. 8).

DISCUSSION

In this group of 12 dogs, the rate related to the operative procedure was 16.7 per cent. However, the 2 deaths occurred early in the series. With changes in suture technic, no further anastomotic perforations occurred.

The proximal l'ne of anastomosis was expected to be the critical "line of exposure" because there met two opposing peristaltic forces. This was borne out by the early dilatation found in the terminal ileum and further by the thickening of the small bowel muscle coats in the dogs that survived longest. Despite this opposition of peristaltic forces, we encountered no difficulty with anastomotic leaks at the proximal anastomosis. It is well to note in considering application to human beings, that this stress point could be further protected in the early postoperative stage by using small bowel tube decompression.

Multiple sites for the proximal anastomoses were chosen to find out if the normal flow of colon contents could be reversed from sigmoid colon to cecum as well as from proximal transverse colon to cecum. No change in stool habits appeared with the anastomoses closer to the right colon, a point which bears out the reabsorptive qualities of the right colon.

The redundancy of the cecum and the ease of mobility of the right colon have long been recognized. In the human application of this technic, it is quite feasible that the terminal ileum be transected flush with its entrance into the cecum and closed. The cecal butt could then be used as the anastomotic site with the rectum, to allow even further extension of the resection sites distally. This procedure was not feasible in the dogs because of anatomic differences.

No studies were made of electrolytic balance, the absorption or excretion of sodium, potassium, chlorides or water. This phase of investigation is now being done.

CONCLUSION

A new anastomotic approach to radical left colectomy in a series of 12 dogs has been presented. The basis of this approach is a reversal of flow of bowel contents from left colon to right. Its satisfactory function has been observed in dogs over varying periods of from 2 to 10 months. All surviving dogs have maintained their preoperative weight or have gained weight. Gross anatomic and roentgenogram changes have been discussed and examples presented.

If absorptive studies on this problem prove as satisfactory as the physical and clinical studies, this procedure may present an adjunctive method of unrestricted left colectomy. By allowing restoration of bowel continuity, this procedure can extend the scope of resection, irrespective of individual physical or anatomic variants.

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MANAGEMENT OF MELANOMA

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It is the purpose of this discussion to consider the management of the malignant mole in light of what we know of its natural history, clinical behavior, and criminal record, *i.e.*, the toll it takes. The reports of end results in the literature are voluminous and all show a disappointingly low salvage with an average 5 year cure rate of about 25 to 30 per cent. We shall not review our results[2] in detail but only augment the current reports by giving our 5 year cures of 82 determinate cases of 145 patients with melanoma seen in the Winship Clinic at Emory University between 1937 and 1952 (table 1). There were 31 patients free of disease at the end of 5 years for a percentage cure rate of 38 (table 2). This relatively high figure probably reflects the greater number of superficial growths in this series, which is too small to be of much clinical significance. It might be pointed out that we have not included in this group juvenile melanomas.

While questions relating to etiology influence the management of melanoma, it would ill behoove us for our purposes here to spend time on the theories as to the origin of these cancers, whether it be neural or epidermal. Let it suffice to say that there seems to be growing agreement that melanoma of the skin arises not from the common intradermal nevus but from the junctional nevus, which is derived from true epidermal cells, or the junctional component of a compound nevus. Almost all agree the pigmentation is a neurohormonal phenomenon associated with the development of melanoma.

Before considering problems of its management let us first review some of the clinical facts we know about melanoma. We are confronted with a vicious malignant process (figure 1) which arises most subtly from an asymptomatic focus for reasons not known. An outline of the general pattern of cancer behavior contains many question marks to indicate our lack of knowledge regarding time and cause (table 3). We do know that clinically the basal cell epithelioma almost without exception spreads only directly, the usual run-of-the-mill squamous carcinoma relatively slowly and with uniform progression via the lymphatics, and sarcoma more commonly via the bloodstream. Melanoma it seems spreads via all possible routes. The variations in the behavior of melanoma are protean, perhaps more so than with any other malignant process. It is possibly the most unpredictable of all tumors.

While we do know that there is some hormonal relationship regarding melanoma because malignant behavior is rare before puberty, in the adult there is only a questionable relationship and that appears to be in regard to prognosis and not cause. Our results are similar to others which have shown a strikingly better prognosis in the female than the male.

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Presented during the St. Petersburg Assembly of the Southeastern Surgical Congress April 2, 1957, St. Petersburg, Florida.

TABLE 1

Total experience

MELANOMAS

WINSHIP CLINIC - EMORY UNIVERSITY
1937-1952

NEW PATIENTS	18,087
NEW CANCERS	6315
MELANOMAS	145

TABLE 2

Follow-up of determinate cases obtained in every instance for a percentage of 100

FIVE YEAR END RESULTS — MELANOMA

STAGE OF DISEASE	DETERMINATE CASES	DEFINITIVE CURES	PER CENT CURES
LOCAL	54	26	48
REGIONAL METASTASIS	26	5	19
DISTANT METASTASIS	2	0	0
TOTAL	82	31	38

We know that there are many factors which clinical data strongly indicate affect adversely the prognosis where melanoma is involved: the greater the size of the lesion, the presence of ulceration, inadequate initial treatment whether it be desiccation, inadequate excision or sometimes biopsy, origins in certain locations as in the mouth and anus, clinical evidence of spread, and development during pregnancy.

Further, it might help to ask ourselves which melanomas do we cure? A general and over simplified answer would include the early ones, which have not spread or spread only locally, those relatively few which spread slowly by the lymphatics as most squamous cancers, and the rare ones in which either the host resistance becomes dominant or the virulence of the tumor subsides. Unfortunately, we have no reliable means of predicting what any particular melanoma will do. Even small thin superficial lesions may already have produced distant metastases.

There are certain points concerning the management of melanoma, actually questions, to which we shall give our attention. They include: What nevi should be removed prophylactically? How wide should the excision of a melanoma be? Should we ever biopsy a melanoma? Is dissection in continuity with excision worthwhile? Is prophylactic dissection of the lymphatics indicated? How wide or extensive should amputations be? What place is there for palliative surgery? What is the value of systemic drugs? What is the place of irradiation?

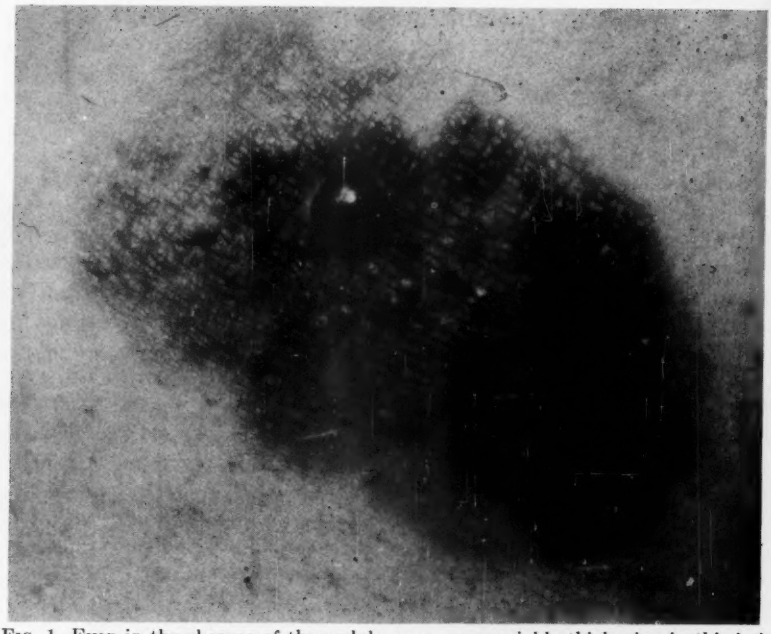
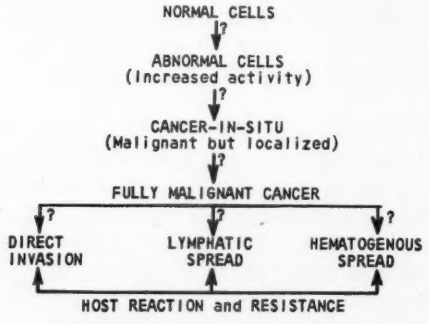


FIG. 1. Even in the absence of the nodule or any appreciable thickening in this lesion the diagnosis should be suspected from the irregular pigmentation and indiscrete border.

TABLE 3

GENERAL PATTERN OF CANCER BEHAVIOR



("?" Refers to time and cause.)

Management: The management of melanoma must be determined in the light of these things we know and some things which now seem to be true or indicated by the available clinical data.

The first problem in management is diagnosis and the most important single factor in the diagnosis is *suspicion*. The surgeon must look at the small, smooth

not-so-characteristic, tan, brown, or black stain, which may present no tumor, no ulceration, and cause no pain, and yet suspect, yes recognize, its true nature and potentialities (fig. 2). And even more he should realize what it may already have done. If the diagnosis is suspected then proper treatment is far more likely to follow. Lesions suspected of being melanoma should be treated with appropriate respect until proved otherwise. The process of establishing the diagnosis may in fact fuse with the process of treatment.

Recognition alone by the clinician may suffice for diagnosis when his experience is adequate. Many times the opinion of the clinician influences the exact evaluation of the possible melanoma microscopically by the pathologist. The clinician and the pathologist must recognize their limitations and their interdependence.

For the most part surgery for the identification of melanoma should include wide excision, at least well beyond the limits of the gross tumor. If there is real question as to the nature of the lesion one might justifiably do an excisional biopsy, and wait until he has the microscopic confirmation of the diagnosis of melanoma before performing an extensive excision possibly with dissection of the appropriate lymphatic structures. If a particular lesion is quite bulky (fig. 3), there is no contraindication to taking a small biopsy with a cold knife and controlling bleeding with chemical cautery. One should avoid the use of electrocautery near the base of melanoma because of the danger of spread of tumor emboli, forced by "tissue gas" into the lymphatics and blood vessels. Our atten-

FIG. 2. This lesion, considerably magnified in this photograph, presented no palpable thickening.

Fig. 3. Bulky nonpigmented subungual melanoma

tion was brought to this point by Amadon[1] in 1933 and clinical studies appear to corroborate his thesis.

The second important problem is treatment and the most important single factor in treatment is the *philosophy* of the surgeon who initially sees the patient and begins therapy. His philosophy is based on and reflects his knowledge of the natural history and clinical behavior of melanoma as well as his experience in treating the disease. He, like the military man, whose mandate it is to conserve and preserve his fighting strength, must be willing early to sacrifice much in an attempt to salvage the most ultimately. What might seem radical may be the least which might provide a reasonable chance of cure and the least which is adequate is not radical. His philosophy will determine whether, for example, he does a prophylactic dissection of the appropriate lymphatic areas. If his experience and the clinical data suggests the efficacy of such a dissection and his philosophy has congealed, he will proceed accordingly.

Some may say: "But I believe in individualization of my patients." Indeed, one should do so provided "individualization" means applying the best procedure one knows in the light of one's knowledge of a particular disease and what the procedure offers that particular patient weighed against the risks involved. But let us avoid confusing "individualization" with rationalization to excuse our wishful thinking regarding a particular patient. We cannot circumvent the fundamental laws of surgery and tumor behavior by wishful thinking under the guise of "individualization."

Let us then look at some of the specific clinical problems in therapy which we must face.

One is frequently faced with the question of what nevi should be removed as a preventive measure. It would be utterly impossible to remove all pigmented nevi which occur and one must therefore have some reasonable plan for deciding which should be removed. Since melanoma appears to occur more frequently on the feet and about the genitals and body openings, there does seem adequate justification for excising pigmented lesions which are observed in these areas

before any change has been noted. Futher, it seems wise to us to remove any nevus which is so located as to be rubbed constantly by the clothing or to be injured frequently.

The local melanoma may be adequately treated by wide excision and grafting of skin if necessary. There is no virtue in grafting per se, and if the skin itself is extremely redundant one need not insist on grafting. But ordinarily if a lesion is adequately excised grafting will be necessary. I know of no measured margins which one might advise but only generally can one say that excision should be well beyond the border of the tumor. If the line which one chooses is grossly inadequate as indicated by obvious subcutaneous nodules one should then go farther. One theoretic indication for wide excision is the regional nature of melanoma as has been pointed out. That is, it is suggested that melanoma frequently arises as multiple separate primary growths in a certain area and some clinical data support this contention.

The principle of excision and dissection of the lymphatics in continuity theoretically has virtue but unless the two areas are quite close it is unlikely that an attempt should be made to apply the principle (fig. 4). Perhaps there is no real value in the element of continuity per se. The spread of tumor emboli from the primary to the lymphatic levels is probably rapid in most instances and only rarely would an embolus or emboli be caught en route. There were some in the past and are even some today who believe that one should remove the primary and then wait a number of weeks before proceeding with dissecting the lymphatics in order that what tumor emboli were en route might have had time to

FIG. 4. The site of this primary lesion on the lateral aspect of the thigh was readily incorporated in the specimen from the groin dissection. Primary healing was facilitated by suction drainage of the wound. The incontinuity specimen included the primary site below and lymph nodes as high as the bifurcation of the aorta above.

arrive at the lymphatic way-station. Beautiful as this theory might be it is not substantiated by any data I know.

Data are accumulating which would indicate that there is virtue in the prophylactic dissection of the appropirate lymphatic areas in the treatment of melanoma. By "prophylactic" we mean dissection before there is clinical evidence of metastatic disease. In certain categories of squamous cancer the value of prophylactic dissection has been, I believe, established very definitely. For example, several excellent studies of squamous cancer of the vulva indicate strongly the value of prophylactic dissection of the groins. If we accept the premise that one of the categories of melanoma which we may cure is that group which spreads in a fashion similar to squamous cancer and that the earlier one dissects the appropriate lymphatics the greater the chance for cure, then one would be inclined to carry out prophylactic dissection generally when it seems practicable. It may not be so strongly indicated after so-considered superficial melanoma although we have all seen instances of distant metastases from a thin surface lesion. There are often instances where the primary melanoma is so located (fig. 5) that one might as logically expect spread to one of several areas as to another and one would justifiably be hesitant to dissect multiple areas prophylactically (fig. 6). Cures after spread to more than one area are rare. In considering this

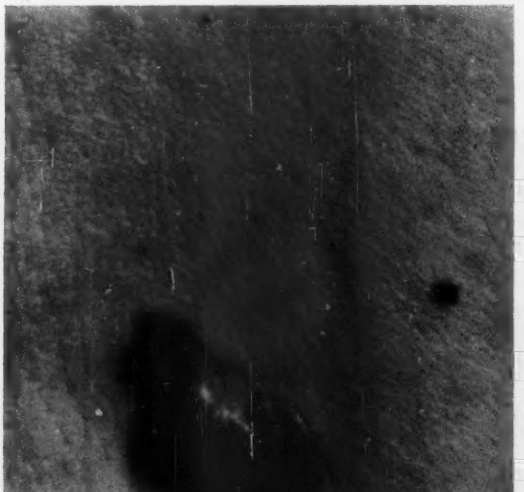


FIG. 5. This lesion was precisely in the midline of the back. The small nodules in this photograph were not melanoma. Prophylactic dissection of the appropriate lymphatic areas would have had to include both axillas.

FIG. 6. Axillary dissections were done only after both axillas became grossly positive simultaneously. The patient was not cured as evidenced by the disseminated nodules in the skin of the anterior chest wall apparent in this photograph.

problem we must balance the morbidity against what improvement might be expected. However, the occasional success in the treatment of locally recurrent melanoma warrants repeated attempts to eradicate residual manifestations of disease when there are no signs of distant metastasis.

Amputation of a digit for subungual melanoma or a foot for deeply infiltrating melanoma of the sole is generally accepted. Amputation of an extremity in instances where the groin or axillary nodes have been dissected and there has been recurrent manifestation of disease in intervening tissue also seems to be warranted. But I believe there remains much question whether extensive amputation is justified when only the primary lesion is manifest. One could not say with assurance that hip joint disarticulation uniformly applied would not increase by a small degree the cure rate for melanoma of the foot, but even theoretically the increase in cure rate at best would be extremely small and probably quite inadequate in view of the great sacrifice. The salvage would include only those instances in which the tumor emboli appeared to spread slowly and diffusely through the tissues progressively up the lower extremity toward the groin as one sometimes sees in an occasional instance where the axillary or inguinal lymphatics have been dissected and further manifestation of disease appears in the soft parts between the primary lesion and the dissected area.

Where there is disseminated disease, that is disease beyond the confines

usually encompassed by surgery, there is very little that one can do. Surgery for palliation is not particular but consists chiefly in removing in appropriate fashion bulky, ulcerative, painful masses, dissecting involved lymphatic areas in an attempt to prevent open breakdown of tissue, or completing neurosurgical procedures for relief of pain. As is often true most mature judgment is required to determine what constitutes palliation. Only in the rarest instance does irradiation have any appreciable influence and that never curative; it has no place in the initial treatment of melanoma. Chemotherapy likewise only rarely slows the growth. One may be justified in using the nitrogen mustard compounds but not to the point of detracting from palliation. There have been no consistent observations concerning benefit from the use of hormones. While there is strong indication as to the influence of hormones on the development of melanoma as, for example, in the case of the usually clinically benign yet histologically malignant juvenile lesion, there is no carry-over into the therapeutic field after the melanoma has become fully developed.

SUMMARY

In summary I should like to emphasize that the most important single factor in the diagnosis of melanoma is suspicion on the part of the individual and the physician and that the most important single factor in the treatment of melanoma is the philosophy of the surgeon based on his knowledge of the disease and his experience with its management. The greatest chance of cure lies in the initial adequate removal of the primary tumor which has not yet metastasized. The surgeon who first sees the patient has this opportunity and challenge.

A rationale for therapy is presented.

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ANORECTAL CARCINOMA ASSOCIATED WITH FISTULA IN ANO

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The purpose of this report is threefold: First, to call attention to the occasional association of fistula in ano and cancer; second, to suggest a triad of symptoms and rectal findings which may permit earlier diagnosis and treatment of these unusual malignancies; and third, to add to the literature the detailed report of 4 cases of fistula in ano associated with malignancy.

The association of cancer with fistula in ano seems generally unappreciated, doubtless because of the widespread acceptance and teaching of the premise of Ewing[5] who quotes Kraske that, "there is no satisfactory evidence that cancer develops in tissues altered by hemorrhoids, fistulae or cicatrices." Rosser,[9, 10] Yoemans,[14] Buie and Burst[2] disagree with Ewing and are convinced that prolonged chronic conditions such as fistulas, scars, and hemorrhoids definitely predispose to the development of anorectal cancer on the basis of the "irritation" theory. Thus one school believes that fistula in ano may cause cancer, while the opposite school holds that the fistula is a result of the malignancy. This report is not concerned with proving or disproving either premise. Of greater importance to the clinician is the recognition that fistula in ano may be the initial manifestation of anorectal cancer, or that a benign fistula may harbor malignancy at some later date.

My interest in this subject was stimulated recently when 2 patients (Cases 1 and 4) of anorectal cancer associated with fistula were under my care simultaneously. A review of the hospital records since 1938 revealed 2 additional cases (Cases 2 and 3). These 4 cases form the basis for this report. In no case was intraluminal cancer present. Therefore, these cases are not to be confused with the finding of fistula in ano as a complication of advanced intraluminal rectal carcinoma as reported by Dukes.[4]

INCIDENCE

A review of the literature would indicate that the development of cancer in a fistula, or fistula as the initial manifestation of cancer, is rare. In 1953 Stockman[12] stated that only 64 cases had been reported, and he added another. Rosser[9] believes that many cases are overlooked by the casual observer, the catastrophe of finding cancer overshadowing any preceding rectal complaints, or the cancer having destroyed the fistulous tract in which it originated. My finding of 4 such cases in a general hospital, which has had neither proctology nor oncology as its dominant interest, would support this belief.

Skir[11] was impressed by finding 2 cases in Negroes in a hospital population

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which is predominantly white. It is of interest that all 4 of these cases occurred in Negroes in a hospital where white patients outnumber colored by a ratio of 3:2.

PATHOGENESIS

In discussing fistula in ano, benign or malignant, the contribution of Tucker and Hellwig[13] is of paramount importance. In 1934 they demonstrated the presence of well developed tubular structures passing into submucosa and muscularis of the normal anorectum and even through the fibers of the internal sphincter muscles (fig. 1.). These ducts empty into the anal crypts, and are lined by stratified squamous epithelium near their openings into the crypt. Deeper in the duct, the lining changes to transitional epithelium and, finally, to columnar epithelium in two or more layers in the depth of the branching ducts. Thus we see that the parent cell for a variety of malignancies is present in the normal anorectal region outside the lumen of the bowel.

TYPE OF GROWTH

Malignancies of the squamous, basal cell, adeno, and colloid types have been reported in anal fistulas. Upon studying case reports in the literature, one is impressed by the predominance of the colloid, or mucinous type. These are slowly growing cancers of relatively low grade malignancy. There may be very little cancerous tissue in comparison to the amount of induration in the anorectal region. Conventional methods of biopsy may reveal only inflammation because of the scarcity of cancer cells. Patients may live for many years following correct histologic diagnosis. In a notable contribution, Binkley and Quan[1] report in

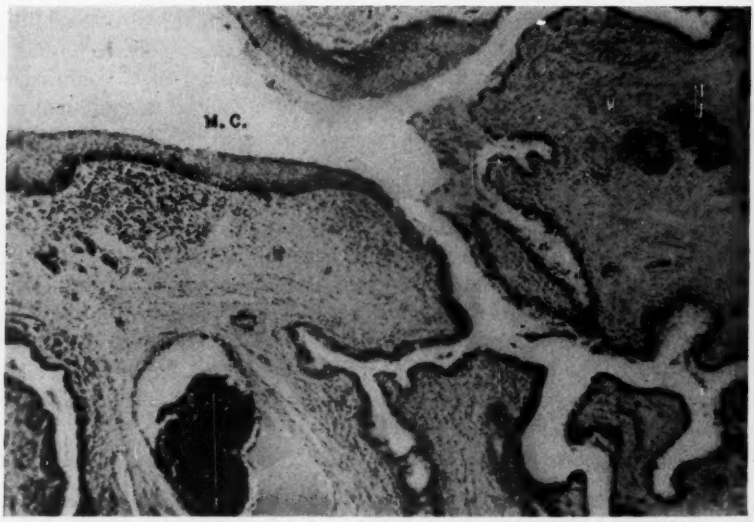

FIG. 1. Photograph of branching anal ducts emptying into Morgagni crypt. Copied from article by Tucker and Hellwig, by permission S.G.&O. Note columnar epithelium, lower center.

detail 6 such cases from the Memorial Center in New York, and have applied the term "Pseudo-Inflammatory Colloid Carcinoma of the Rectum" to this lesion.

This small series includes 1 case of squamous cell carcinoma and 3 cases of adenocarcinoma. Only one of the latter (Case 3) was of the mucinous, or colloid type.

CASE REPORTS

Squamous Cell Carcinoma

Case 1. L. S., a Negro woman, age 31 years, was first admitted to the hospital on June 11, 1932. *Physical:* Examination revealed multiple furuncles around the anus and an "old fistulous tract on the right side of the anus leading anteriorly into the rectum." She was discharged following incision and drainage of the furuncles. Diagnosis: "Fistula in ano, and multiple furuncles of perineum and buttocks." She was readmitted 7 years later on May 11, 1939. *Physical:* Examination revealed the old fistula on the right side and multiple perirectal fistulas and abscesses. The skin of both buttocks was now leathery and thickened. Wassermann and Frei tests were negative. The abscesses of the buttocks and perineum were again drained and she was discharged. Diagnosis: "Multiple perianal fistulas and abscesses."

I first saw her 18 years later on Feb. 6, 1956, when she was 55 years of age. She returned because of severe pain when she tried to sit down. During the 18 year interval, the perirectal drainage had continued with recurring abscesses. She could not recall how many times abscesses had been incised. One year prior to admission, a small ulceration had appeared to the right of her anus at the site of the old fistulous tract. This had gradually enlarged, with increasing pain and constant foul discharge with occasional bleeding. For several weeks she had been unable to sit down and defecation was extremely painful. *Physical:* Moderate cystocele and a large nodular uterus were noted. An irregular ulcerating growth, 8 by 12 centimeters, occupied the entire right gluteal and perianal region, extending medially and anteriorly to the anal verge (fig. 2). A smaller ulceration was present on the left

FIG. 2. Operative photograph Case 1. Rectum has been delivered above. Note thickened skin with multiple sinus openings and edema of vulva. Hemostat indicates extent of excision on left side.

side of the anus. There were multiple draining sinuses involving the perianal region, especially on the right, extending up to and involving the labia. Rectal examination revealed only moderate stenosis. Proctoscopy was painful, but there was no mucosal ulceration or tumor. Multiple biopsies were taken. *Pathologic report:* "Squamous cell carcinoma." Laboratory studies showed an elevated white blood cell count and reversal of the A/G ratio. Frei test was negative. Roentgenograms of chest, lumbar spine and pelvis were negative. Attention was directed toward improving her general condition and control of infection. She was given a high protein diet, vitamins, and multiple blood transfusions. Abscesses were drained and sinus tracts unroofed under anesthesia on 5 occasions.

Abdominal exploration on March 31, 1956, revealed no evidence of lymph node or liver metastasis. The large nodular uterus was removed to provide exposure. Abdominoperineal resection with wide excision of the right buttock, a portion of the gluteal muscle, right vulva, posterior vagina, and perineum was performed. *Pathologic report:* "Grade I squamous cell carcinoma of perianal skin and buttocks with multiple perianal fistulae showing subacute and chronic granulation tissue" (fig. 3). The large posterior wound gradually healed. She became comfortable and began work as a domestic. Except for bladder prolapse, she is asymptomatic without evidence of recurrent disease 1 year following surgery.

Comment: In the absence of induration in the anorectal wall, it is believed that this lesion arose in the perianal skin as a result of constant irritation from recurrent infection, multiple fistulas, and continuous drainage over a period of 3 decades. The initiating lesion was doubtless the neglected fistula on the right side of the anus, which had been destroyed by the growth.

Adenocarcinoma

Case 2. J. A., a Negro man, age 48 years, was first seen on July 24, 1942, complaining of a painful draining sinus to the left of his anus. Four months prior to admission a "pimple" had formed to the left of his anus. Two weeks later it drained spontaneously. Two months

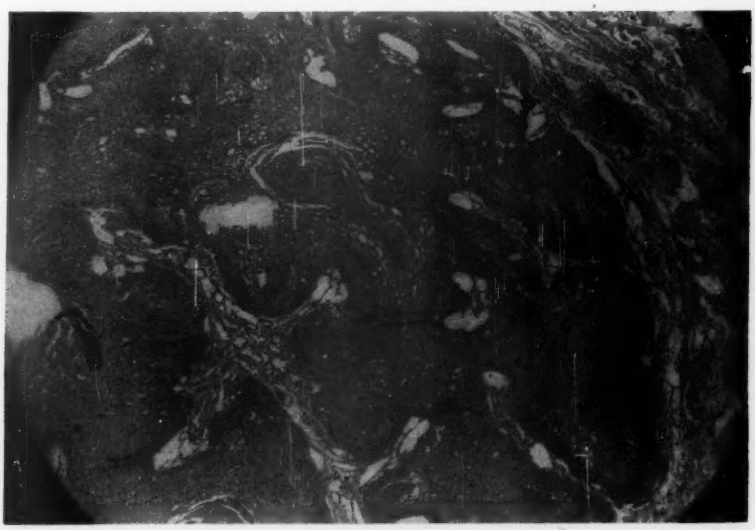

FIG. 3. Photomicrograph Case 1. "Grade I, squamous cell carcinoma, perianal skin and buttocks showing subacute and chronic granulation tissue."

prior to admission, an abscess near the drainage site had been opened by his local physician. Since that time both openings had become larger and more painful, with a thick bloody discharge "like jelly." *Physical:* Examination revealed 2 dirty ulcerations, just lateral to the left anal verge, measuring 2 centimeters in diameter with a surrounding area of firm induration. Both ulcerations connected with a sinus leading up to the left anorectal wall. Rectal examination revealed a spastic anal sphincter with marked induration along the left anorectal wall. No intraluminal tumor could be palpated. Multiple biopsies were taken. *Pathologic report:* "Adenocarcinoma, medullary, Grade II."

X-ray therapy was elected as the treatment of choice, but despite several courses of deep x-ray therapy, the lesion continued to enlarge. Ten months following admission, a "stony, hard lesion the size of a baseball, with marked ulceration of the left buttock involving the sphincter muscle, is present." Proctoscopic examination was performed, and no intraluminal tumor was seen. He was readmitted on May 19, 1943, and sigmoid colostomy was performed, because of extreme pain on defecation. He was readmitted on Aug. 11, 1943, with right chest pain. Chest roentgenogram revealed widespread pulmonary metastasis. He gradually deteriorated and died at home 4 months later on April 2, 1944. This was 20 months following the histologic diagnosis of cancer and 24 months following the initial symptoms of fistula in ano.

Comment: It is believed that this case represents a highly malignant growth arising in the perianal ducts, which burrowed externally to present as a fistulous tract. In this instance, fistula was the first clinical manifestation of anorectal cancer.

Case 3. V. McG., a Negro woman, age 41 years, was first admitted to the hospital on July 13, 1936, for abdominal hysterectomy. The presence of fistula in ano, with the external opening posterior to the anus, was established on this admission. She complained of a "sticky" blood-tinged drainage from the tract, and pain on defecation.

On March 4, 1942, almost 6 years later, she returned to the clinic complaining of pain in her rectum. *Physical:* Examination revealed what was thought to be a very large skin tag with postanal ulcer. There was marked pruritus with thickening of the perianal skin. Frei test was positive, confirming the clinical diagnosis of lymphopathia. The postanal skin tag was excised for examination. *Pathologic report:* "Chronically inflamed anal tissue showing much plasma cell granulomatosis." Two weeks later external ulceration was still present with a sinus tract leading up the rectum posteriorly. The ulcerated area was again excised for pathologic study. *Pathologic report:* "Carcinoma, polypoid, Grade II." Three weeks later the ulceration was "almost healed" and she was referred for treatment of lymphopathia.

She was not seen again until May 22, 1947, more than 5 years following the microscopic diagnosis of cancer, complaining of rectal pain. During the 5 year interval, there had been a bloody, mucoid drainage from the area of previous excision. *Physical:* An external tumor mass, 2 centimeters in diameter, was noted to the right and posterior to the anus. Rectal palpation revealed marked induration and fixation along the posterior rectal wall extending above the reach of the examining finger. Proctoscopic examination revealed a slight stricture just inside the anus and a second stricture 7 centimeters from the anal orifice. There was no ulceration of the mucosa, and no intraluminal tumor mass could be seen. On June 4, 1947, the fungating tumor mass was excised, and the old stricture dilated under anesthesia. *Pathologic report:* "Original sections taken in 1942 were reviewed, and showed similar tumor formation of papillary adenomatous structure covered with hypochromatic epithelium, and showing intense infiltration of inflammatory cells, especially neutrophils. In both original and present sections, it is notable that mucinous formation is prominent. Even though a history of 6 years favors a benign intrepretation of this lesion, it is still believed to be a malignant type. Indeed, the same cell structures not infrequently are seen

in malignant tumors of the large intestines." Diagnosis: "Malignant adenoma of the anus, acute and chronic inflammation" (fig. 4). In view of the positive diagnosis of lymphopathia and the long duration of the lesion, the clinician doubted the diagnosis of cancer. She was discharged with the diagnosis of "lymphopathia and fistula in ano." Six weeks later she was readmitted for drainage of an ischiorectal abscess on the right side. Diagnosis: "Fistula in ano" and "Stricture of the rectum due to lymphopathia." She was readmitted on Aug. 13, 1947, 3 weeks later, and a left ischiorectal abscess was drained. She was under observation for 2 months, and developed multiple fistulas around the anus and sacrum, with slight enlargement of the local growth. All observers now agreed that she had cancer as well as lymphopathia. No intraluminal tumor was ever palpable. She died at home on Feb. 7, 1948, the cause of death being listed as carcinoma of the rectum. This was 6-years following microscopic diagnosis of cancer and more than 12 years following the initial symptoms of fistula in ano.

Comment: This case is typical of the "pseudo-inflammatory colloid carcinoma" with fistula formation as described by Binkley and Quan. It demonstrates the slow growth of these lesions, the difficulty of obtaining a correct histologic diagnosis on biopsy, and the confusion which may arise when a slowly growing malignancy is associated with known benign disease such as lymphopathia.

Case 4. J. E., a Negro man, age 45 years, was admitted to the Lloyd Noland Hospital on Feb. 11, 1955, having been referred by his local physician for drainage of an ischiorectal abscess. Eight years prior to admission, an abscess had formed on the right side of his anus which had drained spontaneously. Drainage had recurred intermittently ever since. For the past several months, he had noticed a bloody, mucoid discharge from the fistulous tract. Four months prior to admission, a hard, nontender mass, "like a match head" developed at the site of drainage. This tiny mass had enlarged rapidly with increasing pain on defecation. *Physical:* Examination revealed the right gluteal fold to be indurated and

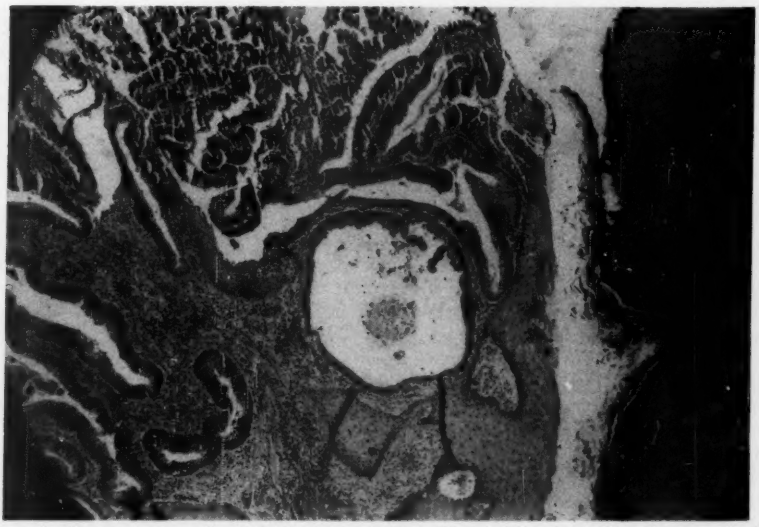

FIG. 4. Photomicrograph of third biopsy (1947), Case 3. Histologically, the same lesion as excised 6 years previously. Note colloid formation and associated inflammation.

exquisitely tender. There was a firm, cauliflower-like mass 4 centimeters in diameter just to the right of the anus (fig. 5), in the center of which was a tiny opening, exuding pus.

On the afternoon of admission, the ischiorectal abscess was drained under pentothal anesthesia. Rectal examination at this time revealed firm induration along the right anorectal wall extending cephalad above the pectinate line. There was no intraluminal tumor. Multiple biopsies were taken from the fungating mass. *Pathologic report:* "Adenocarcinoma of the rectum." Proctoscopic examination was negative for intraluminal tumor, or mucosal ulceration. Barium enema was negative. He was urged to have abdominoperineal resection and inguinal node dissection. He refused, signed his release from the hospital, returned to work, and was not seen until 8½ months later.

On Nov. 2, 1955, he returned to the Out-Patient Clinic because of pain and such progressive enlargement of his right buttock that he was unable to sit down. Although his appetite was excellent, he had lost 25 pounds. He now desired surgery. *Physical:* Examination revealed a large, necrotic, ulcerating tumor mass measuring 10 by 14 centimeters occupying the medial portion of the right buttock and gluteal region extending medially to the anal verge (fig. 6). Rectal examination revealed a hard, irregular, elevated, submucosal mass on the right side extending cephalad 6 to 8 centimeters and anteriorly over the left lobe of the prostate and seminal vesicles. The mass was semifixed. No intraluminal tumor or mucosal ulceration could be palpated and none was visible on proctoscopic examination (fig. 7). Except for moderate anemia, all laboratory studies were within normal limits. Roentgenogram of chest, pelvis and lumbar spine revealed no evidence of metastatic disease. He was given daily transfusions for 4 days and prepared for colonic surgery. On Nov. 14, 1955, surgery was performed. Exploration of the abdomen revealed no evidence of liver metastasis or peritoneal implants. The lymph nodes of the left colonic mesentery, preaortic nodes and celiac lymph nodes were enlarged and firm. Palliative abdominoperineal resection with wide excision of the right buttock and gluteal fold was performed. *Pathologic report:* "Adenocarcinoma of perirectal gland with extension into the rectum and metastasis to lymph nodes of the sigmoid colon."

His convalescence was uneventful, and he was discharged from the hospital 3 weeks following surgery, having gained 10 pounds above his initial admission weight. His posterior wound healed in rapidly, and he returned to his job as a steel worker on the sixty-second postoperative day and worked for 5 months. On March 28, 1956, 4 months following surgery, a firm inguinal node was noted, and he had lost 7 pounds weight. On May 15, 1956, his liver was palpable and nodular. There was mild abdominal distention. He was admitted to the hospital and deteriorated rapidly. Chest roentgenogram showed pulmonary metastasis.

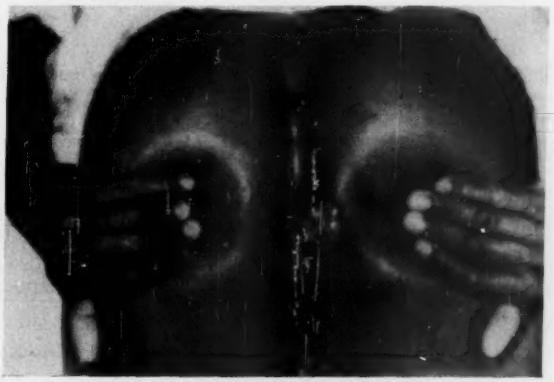

FIG. 5. Photograph Case 4, when first seen February 1955. There was no mucosal involvement. Pathologic Diagnosis: "Adenocarcinoma." Patient refused surgery.

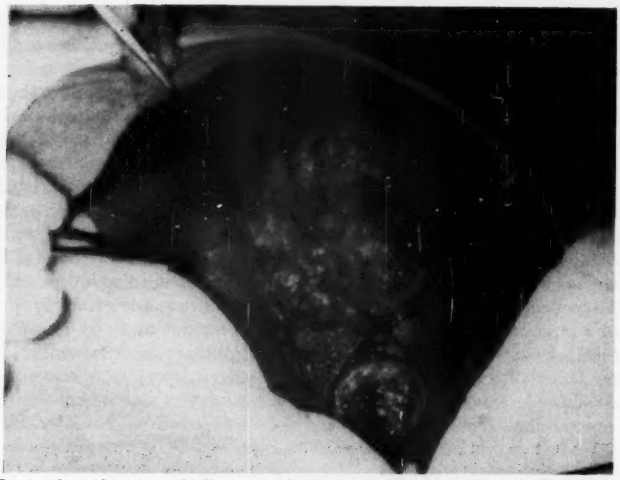

FIG. 6. Operative photograph Case 4, taken 8 months after figure 5. Hemostats indicate extent of perineal excision.

FIG. 7. Specimen from Case 4. Note lymph node metastasis, protruding anal crypt, and the irregular tumor mass elevating the mucosa without ulceration.

There was recurrent ascites. He died on June 27, 1956, 7 months following abdominoperineal resection, 16 months following histologic diagnosis of carcinoma, and 10 years following the initial symptoms of fistula in ano.

Comment: It is doubtful that a growth with the malignant potential to enlarge so rapidly over a period of 8 months (figs. 5, 6) could have been present for 9 years. It is believed that this represents a case in which adenocarcinoma developed in a pre-existing fistulous tract.

DISCUSSION

Table 1 shows the duration of fistula to diagnosis of cancer and death in these patients. Only in the case of squamous cell carcinoma (Case 1) does the duration

TABLE 1

Duration of fistulas

	To Diagnosis of Cancer	To Death
Case 1	28 years	
Case 2	4 months	24 months
Case 3	6 years	12 years
Case 4	8 years	10 years

TABLE 2

Comparative symptoms and rectal findings

Symptoms and Findings of Intraluminal Rectal Adenocarcinoma	Adenocarcinoma in Fistula		
	Case 2	Case 3	Case 4
Rectal bleeding	0	0	0
Constipation	0	0	0
"Pencil" stools	0	0	0
Diarrhea	0	0	0
Pain and/or tenesmus	+	+	+
Mucosal ulceration or tumor	0	0	0

of the fistula seem to be of definite etiologic significance. It is of questionable significance in Case 4. Cases 2 and 3 were doubtless cancer initially.

It should be emphasized that the symptomatology of adenocarcinoma occurring in a fistula, or presenting as a fistula, is quite different from that of intraluminal adenocarcinoma of the rectum. This is because the growth is outside the lumen of the bowel. In table 2 are listed the usual symptoms and rectal findings in adenocarcinoma of the rectum. The column at the right indicates that the only symptom these patients had in common with intraluminal adenocarcinoma of the rectum is pain on defecation. This is a symptom of advanced intraluminal cancer. None of the 3 patients with adenocarcinoma had rectal bleeding, none had diarrhea, none had obstructive symptoms even when the tumor was of very large size, none had intraluminal tumor or ulceration of the mucosa, but all had pain on defecation as an early symptom. All patients used laxatives to avoid a formed stool. Pain and tenesmus might be expected since these lesions involve the sphincters at an early stage and are invariably associated with some degree of infection.

In table 3 are listed the early and late symptoms and rectal findings in the 3 cases of adenocarcinoma. It would suggest that any fistula in ano productive of a bloody, mucoid discharge associated with painful defecation should be suspected of harboring cancer. These are not prominent symptoms of fistula in ano after drainage is well established. The most characteristic early finding on rectal examination is induration in the submucosa and muscular wall of the anorectum out of proportion to the infection present. This finding should make one suspicious of extraluminal anorectal cancer.

TABLE 3

Symptoms and findings in adenocarcinoma in fistulas

	Early			Late		
	Case 2	Case 3	Case 4	Case 2	Case 3	Case 4
Bloody, mucoid discharge	+	+	+	+	+	+
Pain and/or tenesmus	+	+	+	+	+	+
Induration anorectal wall	+	+	+	+	+	+
External tumor	+			+	+	+
Anemia				+	+	+
Weight loss				+	+	+

TREATMENT

The patient in Case 1 was treated by abdominoperineal resection only. Inguinal node dissection was not advised because of low grade malignancy and absence of tumor in the nodes recovered from the large specimen. Her prognosis is considered good. Case 2 demonstrates the futility of x-ray therapy as a treatment of adenocarcinoma of the rectum. Its use is justified in basal cell lesions only. The patient in Case 3 was untreated because of confusion as to diagnosis until the lesion was hopelessly advanced. The patient in Case 4 was treated by abdominoperineal resection without inguinal node dissection as a palliative procedure.

The most desirable form of treatment is prevention and early diagnosis by prompt eradication of any fistulous tract about the anus. Those fistulas productive of bloody, mucoid discharge and associated with excessive induration in the anorectal wall should be completely excised. In every case, sufficient tissue should be removed to permit careful pathologic study. When cancer is detected, abdominoperineal resection with wide excision of tissue on the side of the anus involved will probably give the best results. In selected cases, inguinal node dissection should be added after abdominal exploration and resection.

SUMMARY

Squamous cell carcinoma of the perianal skin may result from repeated infections and constant irritation from fistula in ano of many years' duration (Case 1).

Adenocarcinoma may arise from the anal ducts outside the lumen of the rectum and present as a fistulous tract (Cases 2 and 3).

Adenocarcinoma may arise from the anal ducts in a pre-existing fistulous tract (Case 4).

Given fistula in ano in its chronic stage: the triad of bloody mucoid drainage, pain on defecation, and excessive induration in the anorectal wall should suggest cancer.

Prompt excision of fistula in ano and careful pathologic study of the tissue removed will permit early diagnosis.

When cancer is detected extensive surgery is recommended.

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THE TECHNIC AND UTILIZATION OF STERNUM SPLITTING INCISION IN GENERAL SURGERY

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The general surgeon, in looking to the well recognized principle of adequate exposure and satisfactory hemostasis, may sometime be impeded by the thoracic cage. He may hesitate to disrupt it because of concern over alteration of the normal cardiopulmonary physiology. The thoracic surgeon, on the other hand, is committed to entry into the chest in the accomplishment of many of the procedures in his field. Present day methods readily allow for such extensive procedures, but the risk factor demands consideration.

Under certain circumstances, the rigid portion of the thoracic cage, particularly the sternum, can be divided for better exposure, and reapproximated without great additional hazard to the patient. Neither pleural space need be entered, and if certain safeguards are observed, there is very little interference with respiration, cough reflex, and therefore with pulmonary function.

Intrathoracic extensions from the cervical thyroid, which are anterior mediastinal in location, lend themselves readily to removal through the normally placed cervical collar incision. Every general surgeon knows that when the arterial blood supply of the substernal nodule is controlled, its size is diminished to the point where ready elevation by gentle traction will allow for satisfactory delivery. There will be, however, instances when the surgeon will recognize the propriety of improved exposure in terms of reducing risk. Morcellation within the capsule of the thyroid nodule has accomplished dramatic results. On the other hand, morcellation of a tumor containing nodule would lead to implantation which would be highly undesirable. The possibility of injury to sizable venous structures, with air embolism, the need for packing, and the uncertainty of lack of absolute control would lead one on occasion to add to the cervical collar incision a vertical arm through which the sternum will be split.

Whereas the Lebsche knife is the instrument of choice, simpler tools may be employed. There is a definite retrosternal space which can be developed with the operator's finger, which in turn protects against inadvertent plunging of an instrument into the major mediastinal structures. The retrosternal fascia binds the sternum firmly together and this must be divided to allow for separation of the sternal halves, and with it, good exposure. Inadvertent sudden penetration of the soft sternum by aspirating needles has been reported. Information of a different sort is at hand when we recall the use of substernal tunnels for connecting the cervical esophagus with the stomach by means of the terminal ileum

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and colon. There is a sizable space between the pleural spaces, which may be readily utilized.

One can split the sternum over its entire length or any part of it. Should the surgeon wish to carry his incision into an intercostal space, he must remember the location of the internal mammary vessels along the lateral sternal border. Generally speaking, the intrathoracic thyroid projections which are posterior mediastinal in location, unless they are small and can be delivered through a cervical incision, very often require thoracotomy. Injury to the recurrent nerve, particularly on the right, is of course to be avoided, but presents no more than an ordinary risk. It is not the purpose of this presentation to consider the thoracic aspects of this problem.

It has been our experience that approximation of the divided sternum is best achieved by placement of stainless steel wire sutures. The pointed ends should be turned down and covered by the sternal fascia and seldom do they cause troublesome discomfort. The aspiration of tracheal secretions and the open tracheostomy tube prevent coughing against a closed glottis which would tend to disrupt or produce mobility of such a closure.

Tracheostomy is certainly to be encouraged and performed rather than not, if there is doubt as to its indication. The ease with which it can be done at the operating table under ordinary conditions and the control which it gives of secretion aspiration may be life saving. Even in the female patients, the scarring can be minimal, and pleasantly, even though expensively, covered. The care of the tracheostomy tube, the availability of proper sizes and guides must be insisted upon.

Abdominal incisions may be extended upward onto the sternum. I have not routinely removed the xiphoid process but have rather inspected the degree of exposure with the original abdominal incision extending it only when additional exposure is necessary. Again a retrosternal tunnel is developed. Bleeding may be reasonably free from the sternum, but it is ordinarily not troublesome. The extension of the transversalis muscle and fascia onto the diaphragm at this point is quite evident. The pericardium can be noted above and to the left and division of the diaphragm should be to the patient's right to avoid entry. Inadvertent opening of the pericardium is not a serious mishap, as long as careful closure is carried out and blood is not allowed to gravitate into the pericardial sac. Division of the avascular suspensory ligament of the left lobe of the liver medial to the esophageal hiatus allows the left lobe of the liver to be folded upon itself, covered with a laparotomy pad and protected from injury.

Knowledge of the anatomy about the esophageal hiatus as viewed from the abdominal side is essential. The right crus of the diaphragm divides, to encompass the esophagus, on its way to insertion in the vertebral bodies. The left crus joins the right in its left lateral aspect and is the lesser of the two in importance. *The operator who routinely explores the esophageal hiatus in upper abdominal surgery develops a better concept of derangements in this area.* The sac of this sliding hernia must be divided and when this is done a portion of the sac made up by the pleural

surfaces retracts into the thorax. That remaining attached to the stomach is made up of phrenoesophageal ligament and parietal peritoneum.

The freshened edges of the orifice are then approximated after the manner suggested by Allison. Re-establishment of the normal size of the aperture between the crura with an adequate length of esophagus below will effect a good result.

I have not assiduously avoided injury to the vagus nerve or nerves, because additional esophageal length may be obtained at times through purposeful division of these structures. It is seldom that one completely removes vagus inervation without making this one's primary purpose. The only precaution is recognition of atonia in the stomach in the postoperative period. The patient may describe the same sensory impressions as after vagotomy and gastroenterostomy.

When in the operator's estimate the appropriate degree of tightness about the esophagus is obtained, the phrenoesophageal ligament may then be attached to the under surface of the diaphragm at the hiatus. We have not used gastropexy of any kind as has recently been reported in the British literature. The diaphragm is repaired with multiple interrupted silk sutures, but the sternum again is brought together with stainless steel wire. Tracheostomy is just as useful here as in the previous instance, if not more so. No attempt is made to impair the function of the diaphragm by phrenic nerve interruption, but it is obvious that violent coughing against the closed glottis might disrupt the repair at the esophageal hiatus. As it was said previously, the open tracheostomy tube with the aspiration of secretion tends to minimize this ill effect. The peritoneum may be closed with interrupted silk sutures or chromic catgut according to the operator's preference. It has been our custom to support the abdominal wall by tension sutures of stainless steel wire applied over Davy aluminum buttons. In ordering postoperative roentgenograms of the chest one must remember the presence of the thoracic end of the hernial sac. It has been variously reported by roentgenologists as recurrent hernia, mediastinal fluid accumulation, etc. Rarely will aspiration be necessary. What may appear to be narrowing at the hiatus in barium studies early after surgery, may later develop into a very satisfactory swallowing channel.

SUMMARY

In summary, ofttimes the abdominal repair of an esophageal hiatus may present to the surgeon a serious problem in exposure. By taking advantage of the opportunity available this task may be made appreciably easier. When this is done, the patient, in our estimate, is the one who profits most through ease of convalescence.

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DOLITRONE®: A CLINICAL APPRAISAL

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INTRODUCTION

Dolitrone is an intravenous hypnotic agent used either alone or in combination with other agents and technics. Chemically, Dolitrone is 5-ethyl-6-phenyl-metathiazane-2,4-dione. The comparison of the structure of this agent with that of the barbiturates is shown in figure 1.

Preliminary studies by Thompson and associates[4] on rabbits and dogs, indicated that the drug had low toxicity and produced hypnosis with minimal effects on vital signs. These studies further demonstrated that there was little cumulative effect in animals with the doses employed. Dolitrone was first used clinically for anesthesia and analgesia by Lundy in 1953.[1] The value of the drug as a general analgesic agent was discussed in subsequent reports by this author.[2] Others have indicated disappointment with the agent as either an analgesic or as an anesthetic agent.[3, 5]

This study was to delineate some of the basic properties of Dolitrone. It was not our purpose to compare Dolitrone with other hypnotics, but rather, to evaluate the drug in a way that would answer questions raised during the search for any new and unique agent. The questions are: (1) does the agent have analgesic properties? (2) how rapid is onset and recovery? (3) is there any cumulative action? (4) does it combine well with other agents and technics? (5) how does the agent affect vital signs? (6) what are the side effects? (7) are there any toxic properties? (8) what are the complications, if any, during and after administration? and, (9) does the agent produce amnesia?

MATERIALS AND METHODS

A solution of Dolitrone was prepared from 1 gram lots of the amorphous lyophilyzed white powder to which 40 cc. of distilled water was added to give a 2.5 per cent solution for intermittent injection. This solution has a pH of 11.4. Dolitrone powder may be mixed with saline for continuous drip, but not with glucose in water because of the precipitate that forms in the latter. Intermittent intravenous injection was used almost exclusively in the following series.

Dolitrone was administered for 302 operations on 250 patients of whom 102 were males and 148 females. The least amount of agent that seemed compatible with a quiet surgical field was used in most instances in the short procedures,—these patients were allowed to move on the table if the surgical procedure was not being compromised. In the longer cases and particularly early in the series, larger doses of Dolitrone were given to produce surgical anesthetic depth.

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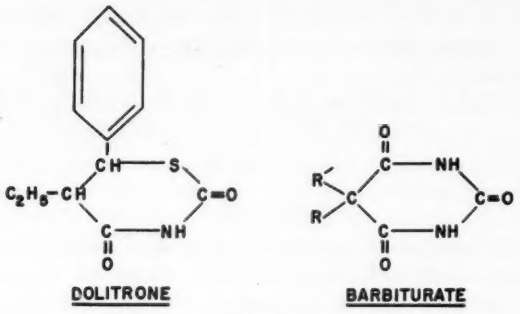

FIG. 1

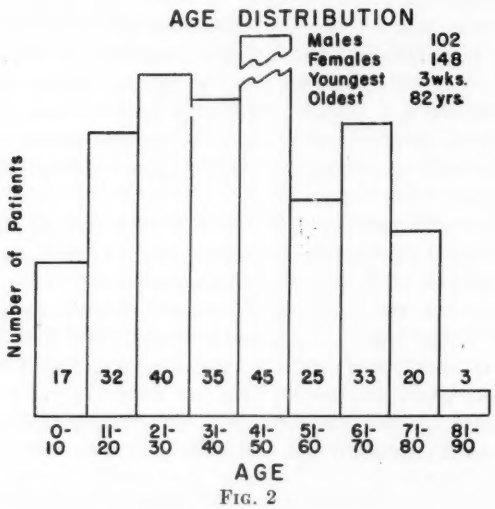

FIG. 2

The age range of the patients was from 3 weeks to 82 years, with the age distribution shown in figure 2. Duration of anesthesia was from 3 minutes to 363 minutes with the distribution shown in figure 3.

The various surgical services involved are shown in figure 4. A preponderance of the gynecologic patients had short procedures such as dilatation and curettage. Most of the patients undergoing plastic procedures were for burn debridement or change of burn dressings. Duration of anesthesia for 183 patients was less than ½ hour, and for 249 patients, was less than 1 hour.

Regardless of the fate of Dolitrone, whether it is combined, destroyed, eliminated, or stored, it was decided to calculate the amount of Dolitrone used per minute to attain and maintain the quiet anesthetic state. It was further decided to divide the series into two groups, those lasting less, and those lasting more than 15 minutes.

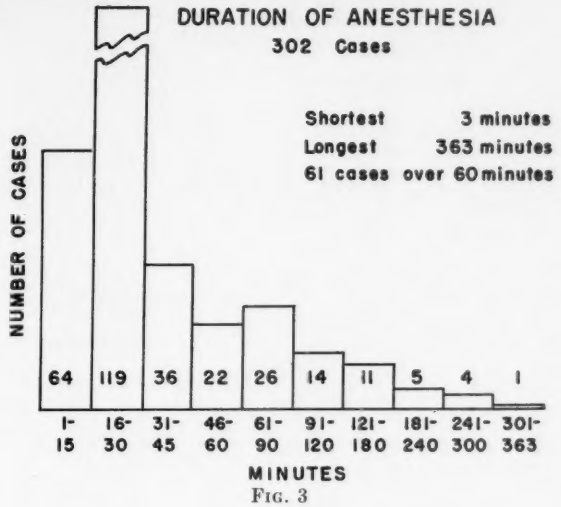

FIG. 3

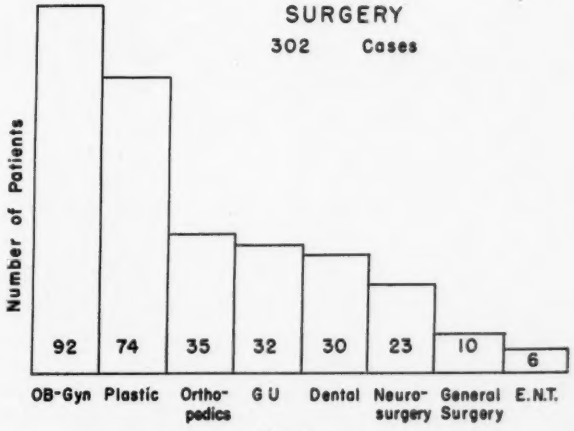

FIG. 4

RESULTS

Table 1 shows the results in the 37 patients who received Dolitrone alone, without premedication and without supplemental anesthesia. This shows definite cumulative effect; the 13 patients receiving Dolitrone over a period of less than 15 minutes required an average of 61 mg./minute, or over 2 cc./minute of the 2.5 per cent solution, for maintenance of anesthesia. The 24 patients whose operative period lasted longer than 15 minutes required only 31 mg./minute for maintenance.

Dolitrone was used with premedication but without other supplement in 154

TABLE 1

Dolitrone without premedication (37 cases)

Age, 15–78 Years; Time, 4–70 Minutes

13 Less than 15 Minutes	
Dosage	125–750 Mg.
Mg. of Dolitrone/Minute	16–124
Mean	61 Mg./Minute
24 Over 15 Minutes	
Dosage	350–2000 Mg.
Mg. of Dolitrone/Minute	6–56
Mean	31 Mg./Minute

TABLE 2

Dolitrone with premedication (154 cases)

Age, 16–82 Years; Time, 4–86 Minutes

34 Less than 15 Minutes	
Dosage	50–875 Mg.
Mg. Dolitrone/Minute	12–94
Mean	44 Mg./Minute
120 Over 15 Minutes	
Dosage	225–2625 Mg.
Mg. Dolitrone/Minute	6–63
Mean	25 Mg./Minute

patients, (table 2). Premedication usually consisted of barbiturate, opiate, and atropine. Again, the cumulative effect is noted, as the short procedures require considerably more Dolitrone per minute than do the longer ones. Also, the effect of the premedication is apparent as both groups require less Dolitrone per minute in their categories than do the respective patients in whom no premedication was given. Whether the premedication enhances the anesthetic effect or whether it slows the inactivation of Dolitrone, less agent is used when premedication is given.

Dolitrone was used with premedication and with nitrous oxide anesthesia in 29 patients. None of these operative periods lasted less than 15 minutes. Although less Dolitrone is needed per minute in this group than in the longer operative periods where premedication alone was given, Dolitrone is still used at a rapid rate. Even when nitrous oxide is the main anesthetic agent, Dolitrone is used at a rate of 19 mg./minute, (table 3).

Premedication, nitrous oxide, and succinylcholine were used in 6 patients who were given Dolitrone. The results are shown in table 4.

In 30 patients with regional block, Dolitrone was used to determine the mini-

TABLE 3

Dolitrone with premedication and nitrous oxide (29 cases)

Age	16–82 Years
Time	17–363 Minutes
Dosage	325–5000 Mg.
Mg. Dolitrone/Minute	4–55
Mean	19 Mg./Min.

TABLE 4

Dolitrone, premedication, nitrous oxide muscle relaxant (6 cases)

Age	31–69 Years
Time	72–245 Minutes
Dosage	1500–5950 Mg.
Mg./Minute	8–33
Mean, Mg./Minute	18

TABLE 5

Dolitrone with premedication and block (30 cases)

Age	18–81
Time	35–213 Minutes
Dosage	50–1400 Mg.
Mg./Min.	1–26
Mean	8 Mg./Minute

mal amount of the drug required to provide and maintain hypnosis and amnesia. The results of this study are shown in table 5. The mean of 8 mg./minute represents the rate Dolitrone is utilized for hypnosis and amnesia if analgesia is not necessary.

There were 36 pediatric cases, the patients ranging in age from 3 weeks to 13 years. Their weights varied from 9 pounds to 145 pounds. There were patients in this group in every stage of childhood metabolic acceleration and deceleration. The results are shown in table 6. An interesting finding was the utilization of Dolitrone per pound of body weight for each minute of anesthetic time. The pediatric patients used Dolitrone at a rate of 0.49 mg./lb./minute compared with a series of adults with a mean of 0.15 mg./lb./minute. Pediatric patients inactivate or eliminate Dolitrone at 3 times the adult rate, on a per pound basis.

Figure 5 shows the comparison of these various groups and their per-minute utilization of Dolitrone. The number of cases in each group is shown at the bottom of the graph.

There were 10 miscellaneous cases in the series. In these Dolitrone was used as an induction agent for cyclopropane (3 patients); no premedication, but with nitrous oxide (2 patients); with premedication and with muscle relaxant (2 patients); without premedication, but with local block (1 patient); and without premedication, but with ethylene (2 patients).

TABLE 6

Pediatric (36 cases)

Age	3 Weeks–13 Years
Weight	8.8–145 Lbs.
Time	5–363 Minutes
Dosage	30–4000 Mg.
Mg./minute	5–43
Mean	22 Mg./Minute
Mg./lb./min.	Mean—0.49
Adults	0.15

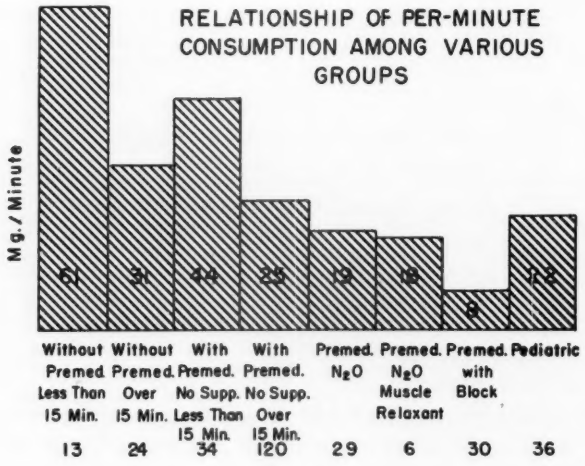

FIG. 5

The complications occurring during Dolitrone anesthesia are shown in table 7. There were 2 cases of laryngospasm; both cases were precipitated by manipulation about the mouth and pharynx. There was one case of bronchospasm. Marked elevation of blood pressure occurred in 7 patients,—a persistent rise of 25 mm. Hg. or more from the patient's preoperative blood pressure was used for the criterion of significant elevation. Tachycardia occurred in 13 patients,—a persistent increase of 10 beats/minute or more being the measure. Extrasystoles were noted in 4 patients.

Postoperative complications are summarized in table 8. No patient who has received Dolitrone alone has had any postoperative nausea or emesis. Thrombosis and thrombophlebitis were seen in 5 patients. This diagnosis was made if the patient complained of pain at the site of injection, or if there was clinical evidence of phlebitis. Small, transient lumps at the site of injection which had no other evidence of phlebitis were disregarded. Respiratory depression occurred in 3 patients. These were seen early in the series when Dolitrone was used in massive doses, (3–6 Gm.) for long, major surgical procedures. Erythema appeared in 2

TABLE 7

Complications during anesthesia (302 cases)

Laryngospasm	2
Bronchospasm	1
Elevation of B.P.	7
Tachycardia	13
Extrasystoles	4

TABLE 8

Postoperative complications (302 cases)

Nausea and/or emesis	24
Thrombosed vessel	5
Thrombophlebitis	4
Marked respiratory depression	3
Erythema	2
Deaths	2

TABLE 9

Advantages

1. Fast acting.
2. Pleasant to patient.
3. Effect wears off rapidly when used in average doses.
4. Pulse, blood pressure stable in presence of respiratory depression.
5. May be used in analgesic technic.
6. Produces excellent amnesia.

TABLE 10

Disadvantages

1. Clinical thrombophlebitis and thrombosis occur occasionally.
2. Not potent as anesthetic agent.
3. Large doses (3–6 grams) may be followed by prolonged narcosis (up to 12 hours).
4. Occasional skin reactions.
5. Purposeless movement or muscular twitching.
6. Respiratory depression with large doses.

patients following the administration of Dolitrone. Both patients cleared after antihistamine therapy. There were 2 postoperative deaths in this series. Neither appeared to have any relationship to Dolitrone anesthesia. Both patients died several days following the surgical procedures.

The advantages of Dolitrone are listed in table 9. The drug does seem to possess a wide margin of safety. Respiration is the first vital function to be depressed. Amnesia is excellent when the drug is used in the average doses shown previously.

The disadvantages of Dolitrone are summarized in table 10. The purposeless movement and muscular twitching is very annoying when it occurs,—this may

TABLE 11

Unsatisfactory results with Dolitrone

1. T & A. Relaxation poor, succinylcholine given.
2. ARTERIOGRAM. Patient moved excessively during procedure.
3. RESECTION OF BLADDER TUMOR (spinal). Patient cyanotic during surgery, nauseated for 48 hours postoperatively.
4. LAMINECTOMY. Attempted endotracheal intubation using Dolitrone without relaxant; laryngospasm occurred when the endotracheal tube touched the cords.
5. SKIN HOMOGRAFT FROM THIGH (history of bronchial asthma). Dolitrone 25 mg. given for test dose; additional 5 cc. given 2 minutes after first injection; patient developed marked repiratory difficulty.
6. BURN DRESSING. Phlebothrombosis following previous Dolitrone injection prevented adequate blood levels on subsequent administration in the same vein.

be related to the technic of administration, but as yet we have not been able to eliminate its occurrence.

Unsatisfactory results are shown in table 11.

DISCUSSION

The most important objections to the use of Dolitrone for clinical anesthesia center around: (1) occasional production of purposeless movement; (2) danger of phlebothrombosis and thrombophlebitis; (3) the inconsistency of the agent; (4) the impotence of the agent for general anesthesia; (5) difficulty in attaining the analgesic state in many patients; and (6) difficulty in administering sufficient Dolitrone in some patients by the intermittent technic.

Our experience has included all of these objections. However, difficulties were more numerous during the first 100 patients than during the second and third hundred. Some objections such as the production of purposeless movement have persisted throughout the entire series. Positioning of the arm to help venous return, and washing the solution through the vein rapidly reduces the incidence of chemical thrombophlebitis. Inconsistency in the effect of the agent from patient to patient is still important, but this has decreased along with increased experience with the drug on the part of the anesthesiologist. The impotence of the agent for general anesthesia must be admitted, but we have yet to determine whether this is helpful or harmful. Difficulty in attaining the analgesic state has been the source of much contention. The question is, whether the production of analgesia rests ultimately within the chemical structure of the agent, or within the technic of eliciting the analgesic state by the anesthesiologist. Certainly, few patients spontaneously go into the quiet, dreamy, analgesic state in which they respond to auditory but not to surgical stimuli. Some anesthesiologists who are actively enthusiastic about achieving this analgesic state seem to be able to elicit a state reminiscent of narcohypnosis in a larger number of their patients. The drug itself then, is not consistent in the production of analgesia. The difficulty of maintaining per minute requrements for some patients by the intermittent technic is a real problem, particularly in the alcoholic patient. These patients with increased anesthetic requirements, (not all are alcoholic addicts) cannot be

given larger doses per injection because the immediate effects are too profound. Further, regardless of dose, the effects of one injection are so transitory that another injection is needed too soon. It is probable that continuous intravenous drip regulated to fit the mg./minute requirements of the patient would be the ideal method of administration. Giving Dolitrone by the intermittent method to maintain smooth anesthesia is somewhat analogous to giving succinylcholine by the intermittent method to maintain smooth relaxation. It can be done, but it is cumbersome process, subject to many errors in judgement. If the pH and physical properties of Dolitrone were altered to allow its mixture with 5 per cent Dextrose in distilled water for continuous intravenous drip, many of the objections to the agent could be dispelled.

Finally, it may be said that it is too early yet to either accept or reject Dolitrone as an adjunct to anesthesia. If nitrous oxide had been an unknown agent and were now being evaluated for the first time on the basis of 300 cases, there is a good chance that it would fall short of expectations. Nitrous oxide alone without premedication could be used in 30 or 40 patients, for example. Then nitrous oxide with light premedication, but without other supplement, could be studied, and so on. A similar comment could be made about many of the agents now in use. In the search for a safe agent to open a new field of general analgesia, no agent should be rejected lightly, as the lessons learned from one may help in the development of the next.

SUMMARY

Experience gained in the use of Dolitrone in 250 patients for 302 operations is presented. The properties of the drug, based on clinical signs, are discussed. Advantages and disadvantages, complications, and unsatisfactory results are presented, with discussion of each.

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RECURRENT ULCERS FOLLOWING GASTRODUODENAL SURGERY FOR BENIGN ULCERS

REPORT OF A CASE OF GASTROJEJUNOCOLIC FISTULA FOLLOWING GASTRIC RESECTION FOR GASTRIC ULCER

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One of the most serious complications that occurs during the late postoperative period folowing surgery for benign ulcers of the stomach or duodenum is the development of a recurrent ulcer, usually in the jejunum near the site of its anastomosis with the stomach. This rarely occurs following surgery for gastric ulcers, and I have not seen or heard of it complicating surgery for gastric carcinoma, but it has been a significant problem with which to cope when dealing with duodenal ulcers. During the first 30 to 40 years of this century, gastroenterostomy was a very frequent and fashionable operation used without much discrimination for almost all types of disorders thought to arise in either stomach or duodenum. This operation could be done with considerable safety by those with limited surgical experience and indications for doing the operation were fairly broad because they were frequently based on symptoms rather than on fluoroscopic and x-ray evidence of a definite pathogic entity. Following the published reports of Von Haberer, Beers, Fenster, Hocheneggs, Bastinanelli and other European surgeons, along with those of Lewisohn, Berg, Lahey, Straus and others in America, calling attention to the high incidence of stomal ulcers following gastroenterostomy for duodenal ulcer, gastric resection gradually supplanted this more "conservative" procedure.

I have a vivid recollection of attending a meeting of the New York Surgical Society in October 1925, and hearing Dr. Lewisohn present a paper on, "Failure of Gastroenterostomy to Effect a Decisive Reduction in Gastric Acidity".[8] Some of his observations were as follows: Complete anacidity had been found following partial or subtotal gastrectomy done for gastric ulcer in 77 per cent of cases, while this had occurred in less than 3 per cent following gastroenterostomy with or without excision of the ulcer. Pylorectomy had been followed by a considerable number of jejunal ulcers. His conclusions were that partial or subtotal gastrectomy should be the method of choice in the surgical treatment of gastric and duodenal ulcers. Lewisohn's[7] observations had shown 34 per cent gastrojejunal ulcers following gastroenterostomy for duodenal ulcer, 18 per cent proved by operation and 16 per cent by symptoms and x-ray findings. In the discussion that followed this presentation of these observations and recommendations, comments were scathing. The idea of removing a large part of the normal appearing stomach in order to cure a lesion in the duodenum of only a few millimeters in diameter seemed preposterous.

In an article by Balfour[1] of the Mayo Clinic in 1926, the following statement

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was made: "Although the operation (gastric resection) entails but little more risk than gastroenterostomy, this fact alone does not recommend it, and it is doubtful whether the end results will show that it has any superiority over less mutilating procedures."

In the years that followed, it became the experience of practically everyone doing any considerable amount of gastric surgery that favorable results following gastric resection far outweighed those following gastroenterostomy for benign ulcers of the stomach and duodenum. It soon became apparent that the greater the amount of the acid-secreting part of the stomach that was removed, the fewer recurrent ulcers that later developed. This observation resulted in the adoption by many surgeons of the routine removal of from 70 to 80 per cent of the stomach when duodenal ulcer patients were subjected to surgery. While these high resections decreased the incidence of recurring ulcers, they resulted in many observers coming to the conclusion that postgastrectomy symptoms were greatly increased. With these observations, I heartily agree. Many came to the conclusion that it was better judgment to risk the development of a recurrent ulcer and do a less radical resection with the knowledge that a higher resection could be done later, if it became necessary.

Since the problem of the formation and treatment of benign gastroduodenal ulcers is largely the problem of control of gastric acidity and recurrent ulcers very seldom, perhaps never, occur in the presence of complete anacidity, other methods of accomplishing this end result without sacrifice of a large part of the stomach has been the objective of many investigators. It has been determined that there are two principal sources of origin of gastric acidity: one of cephalic origin resulting from stimulation of the vagus nerves; the other, hormonal, arising from stimulation of the antral gastric mucosa. Vagal stimulation of the acid-producing glands of the stomach is generally thought to be the principal factor in the causation of duodenal ulcers, while hormonal stimulation of these same acid-producing glands apparently is the principal factor in the causation of gastric ulcers. Dragstedt, in recent years, has again called attention to the vagus nerves and their relationship to the problem of duodenal ulcer. Since this time, the literature for and against the use of vagotomy in the treatment of this condition has become voluminous. Vagotomy alone has been found to be insufficient because of its interference with gastric emptying. In order to correct this deficiency, pyloroplasty, gastroduodenostomy, gastroenterostomy and various extents of gastric resection have been combined with this procedure. From my observations, I am led to believe that with increasing experience, there is a definite trend away from radical resection of the stomach with more reliance being placed on the assistance to be gained from vagotomy.

In a recent panel discussion of this problem at the October 1956 meeting of the American College of Surgeons, Zollinger, of Columbus, Ohio, and Smithwick, of Boston, advocated hemigastrectomy combined with vagotomy. Smithwick stated that his investigations over a period of 6 to 7 years showed that higher resection of the stomach under these conditions was not necessary to insure adequate anacidity. Since a large part of the acid-producing portion of the

stomach is removed and enough is retained to prevent many of the postgastrectomy symptoms that develop when 75 to 80 per cent of the stomach is resected, this type of operation, it seems to me, has much to recommend it.

In our experience, all recurrent ulcers coming to surgery have occurred in the neighborhood of the gastroenterostomy stoma, generally in the jejunum, sometimes involving both stomach and jejunum, and more rarely entirely gastric in location. In all instances except one, the original duodenal ulcer had apparently healed. Stomal ulcers usually develop in the first few months or years following the original operation, although there are many exceptions to this rule. Symptoms of stomal ulcer may simulate those of the original lesion, although the relationship to the ingestion of food is less common. Pain is usually intermittent in nature and is localized in most instances to an area to the left and above the umbilicus corresponding to the region of the gastroenterostomy. There is usually tenderness in the same area. Hemorrhage may be a prominent feature, recognized grossly by blood in the stools and occurred in over 50 per cent of our patients. Vomiting of blood is of much less frequent occurrence. The diagnosis of stomal ulcer is made from the history, usually although not necessarily substantiated by fluoroscopic and x-ray studies, and at times by gastroscopic examination. In several of our patients, x-ray examination did not reveal a shallow ulcer crater easily discernible on gastroscopic examination. Most stomal ulcers respond very poorly to conservative measures, although no doubt a short period of medical treatment should be tried. They may perforate into the general abdominal cavity or since they lie in close proximity to the transverse colon expecially if the posterior type of anastomosis has been made they may penetrate the wall of the colon, thus forming a gastrojejunocolic fistula. In 2 of our patients, this occurred, and in several the outer wall of the colon had been penetrated. For these reasons, it is unwise to prolong medical treatment unles definite improvement is obvious.

One of the reasons advanced for doing an antecolic anastomosis is to prevent involvement of the colon if a jejunal ulcer develops. In the 23 cases of stomal ulcer being reported, only one occurred following an antecolic anastomosis, not, I believe, because they are less prone to occur following this type of anastomosis, but because the porterior type has been much more widely used in this community. Admittedly, it is easier to resect a stomach for a jejunal ulcer in which the anastomosis has been done anterior to the colon, although no insurmountable difficulties have been encountered when the other type has been used. At least in my own experience, the possibility of the development of a stomal ulcer and rarely a gastrojejunocolic fistula with the necessity for its surgical correction is not of enough importance to influence me to favor antecolic anastomoses.

Surgical measures to correct stomal ulcers for the most part have consisted of high gastric resection. In spite of this, in some individuals, ulcers have continued to recur so long as any gastric mucosa remained. Recently Zollinger called attention to the association at times of islet cell pancreatic tumors with these recurrent ulcers, the removal of which resulted in cure of the patients' ulcer diathesis. These observations were presented before the American Surgical Association in April, 1955,[12] and I was interested in hearing Whipple, Jenkins, Dragstedt, and

Moyer report similar experiences. Since Dragstedt's revival of the use of vagotomy in the treatment of duodenal ulcers, this method of approach has been widely used in the treatment of stomal ulcers. In our own rather limited experience, it has been used successfully, and judging by the reports of others, it is proving to be a very valuable adjunct in the treatment of this condition.

When a stomal ulcer occurs following gastroenterostomy, or a limited gastric resection, I believe that approximately 75 per cent of the stomach should be resected combined with bilateral vagotomy. If the ulcer follows a previous high gastric resection, serious consideration should be given to doing a transthoracic vagotomy. The operation under these circumstances is usually easier to do because of working in a virgin field, and one can be more sure of its being complete. This approach unless the diaphragm is opened does not permit of exploration of the abdomen which is always desirable to confirm the diagnosis, and to permit of examination of the pancreas or other areas that might be contributing to the patient's symptoms.

In looking up the avialable records of the Straub Clinic over the past number of years, I was able to find evidence that 22 patients had been subjected to surgery for stomal ulcer, while another had died of a ruptured stomal ulcer proven by autopsy without benefit of surgery. During this time our records show that 398 duodenal ulcers and 326 gastric ulcers have been subjected to various types of operations. Twenty of these stomal ulcers followed operations for duodenal ulcers, 2 for gastric ulcers and 1 followed surgery for relief of duodenal obstruction. In 15 of the duodenal ulcers, posterior gastroenterostomy alone had been done; in 1 a Devine pyloric exclusion operation; 5 followed gastric resection. In one of these resections, a very limited amount of the pylorus had been removed; in another about 50 per cent of the stomach; in 2 about two-thirds of the stomach; and in the other about 85 per cent of the stomach. In the latter, a long loop of jejunum anterior to the colon was used for the anastomosis with an entero-enterostomy between the limbs a considerable distance away from the stoma. No doubt this played a major role in the development of the anastomotic ulcer. In the 3 patients in whom a high gastric resection had been done, and one in whom the resection had been less radical, the stomal ulcer was treated by transthoracic vagotomy. Results to data have been satisfactory 11, 5, 4 and 1 year later. The 15 cases following gastroenterostomy were handled by high gastric resection combined with vagotomy in four. One individual was treated successfully by the Devine exclusion procedure. In the 2 gastric ulcer cases, one had followed what was described as being a wide gastric resection because it grossly appeared to be carcinoma followed by Billroth I type of anastomosis. However, at the time of the second operation, it appeared as though a relatively small amount of stomach had been removed. The other followed about 60 per cent resection of the stomach and a Polya-Hofmeister anastomosis. All these recurrent ulcers occurred in males except for 2. The oldest individual at the time of operation for the stomal ulcer was 62, the youngest 9, the average age being 37 years. The shortest time between the original operation and the date of operation for removal of the stomal ulcer was 6 months, although one died following perforation of the ulcer at 10 weeks.

The longest period of time was 29 years, the average being 8½ years. In 1 patient, it was 13 years; in 2 patients it was 16 years; 1, 19 years; 1, 20 years; and 1, 25 years. This certainly indicates that it takes a long period of observation to determine end results in operations for benign ulcers of the stomach and duodenum. Fourteen of the stomal ulcers bled, recognized by gross blood in the stool or severe anemia. In 4 cases, the history records vomiting of blood. In 9 of the patients, I had performed the original operation; in 14, they had been done elsewhere; none had been done by my younger associates, an indication that the sins of my youth based on ignorance of the fundamental problems underlying the treatment of such ulcers in earlier years are coming home to roost.

A brief resume of a few of the more unusual cases may be of interest.

CASE REPORTS

Case 1. A Chinese boy at the age of 6 developed symptoms suggestive of duodenal ulcer. Three years later, he had marked pyloric stenosis characterized by nausea, vomiting, visible epigastric peristalsis and x-ray study showing a deformed duodenum and marked gastric retention.

In February, 1931, a posterior gastroenterostomy was done. Three months later he had gained 5 pounds and was feeling well. Seven months postoperatively, he had developed all the typical signs and symptoms of a stomal ulcer, with marked anemia, blood in the stools and x-ray showed a stomal ulcer crater (fig. 1). A high gastric resection was done. Now 26 years later, the patient has had no further stomach trouble.

One of the most serious complications of stomal ulcer is perforation, either into the colon or into the general abdominal cavity. Two each of these complications have occurred in this series of cases.

Case 2. A Caucasian male, age 58, who had suffered from a duodenal ulcer over a period of 30 years, had had a gastroenterostomy performed in Japan in December 1940. He was seen by me on June 6, 1945, complaining of abdominal pain with board-like rigidity of the abdominal wall. Exploration of the abdomen revealed a gastroenterostomy posterior to the colon with a small perforated stomal ulcer. This was closed and 1 month later a high gastric resection was done. The patient made a good recovery, dying 9 years later of pneumonia.

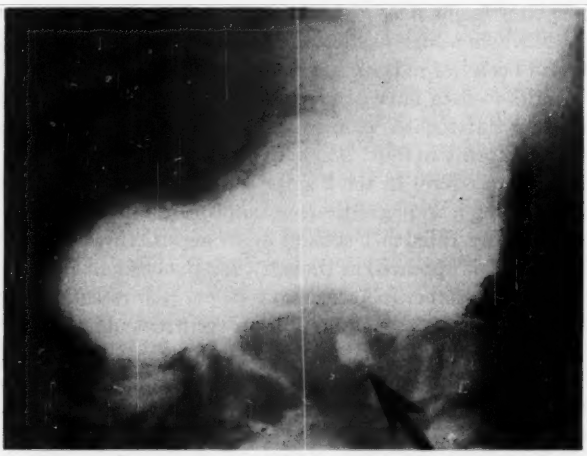

FIG. 1. Case 1. Arrow points to stomal ulcer crater

Case 3. A Caucasian female, age 40, had a Devine pyloric exclusion operation on Aug. 16, 1935, for duodenal ulcer. On October 29, 10 weeks later, she was admitted to the hospital in extremis and died of a generalized peritonitis, autopsy showing a perforated stomal ulcer.

Case 4. A Filipino, age 23, had a gastroenterostomy done by me in 1920, for duodenal ulcer. Twenty-five years later a high gastric resection was done for a marginal ulcer, demonstrated by gastroscopy (fig. 2).

Case 5. A Japanese male, age 25, was operated upon by me for a duodenal ulcer in 1928. The ulcer was found adherent to the side of the gallbladder which prevented its perforation. These structures were separated, the ulcer was burned out by cautery and the edges were brought together by suture and closed over by surrounding omentum. Elsewhere in 1951, because of severe hemorrhages, a transabdominal vagotomy was done. The patient was seen by me in December 1956, because of severe epigastric pain. A gastric analysis showed a pH of 1.2 with 4 plus free hydrochloric acid. A high gastric resection was done in January 1957, for a stomal ulcer in the efferent loop of the jejunum.

Case 6. A Male, age 18, had a gastroenterostomy elsewhere for duodenal ulcer in 1930. Five years later, a stomal ulcer was excluded by the Devine type of operation (fig. 3). Surprisingly enough, the patient made a good recovery. Nineteen years later, he wrote that he was living in California, feeling fine and had advised one of his friends to come to Hawaii to have a similar operation on his stomach.

Case 7. A Caucasian male, age 59, had a very high gastric resection for duodenal ulcer on May 4, 1955. Long loops of jejunum anterior to the transverse colon with enterostomy between the limbs, as shown in figure 4, was done. Several months later, the patient developed symptoms compatible with a diagnosis of stomal ulcer, and this was confirmed by x-ray study. On Dec. 6, 1955, a transthoracic vagotomy was done. To date the patient has been relieved of gastric symptoms.

Case 8. A Caucasian female had her appendix out at the age of 21 for abdominal pain without relief. Two years later, in July 1933, because of nausea, vomiting, epigastric pain and distress, x-ray showing marked gastric retention and findings suggestive of a duodenal ulcer, the patient was explored. No abnormality was made out in the stomach or duodenum. An incision made across the pylorus to enable more adequate exploration of the duodenum was converted into a pyloroplasty. The same symptoms and x-ray findings persisted, and on Aug. 28, 1933, a posterior gastroenterostomy was done, again without relief. Later x-ray studies showed dilatation of the duodenum with obstruction of the third portion (superior mesenteric vessel syndrome). On Feb. 22, 1935, the efferent loop of the gastroenterostomy was anastomosed to the retroperitoneal portion of the duodenum. On March 16, 1949, a resection of the stomach and bilateral vagotomy, as shown in figure 5 a and b, were carried out for a large stomal ulcer. Postoperatively, the patient was bothered with marked dump-

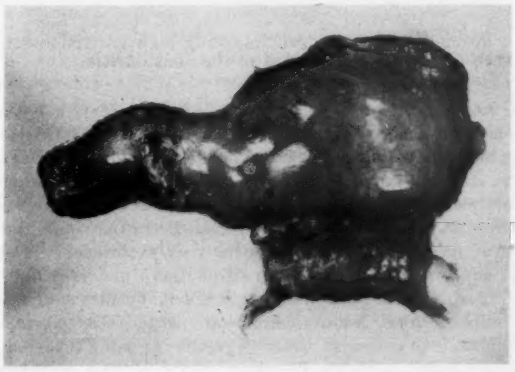

FIG. 2. Case 4. Shows amount of stomach removed with the limbs of the previous gastroenterostomy attached.

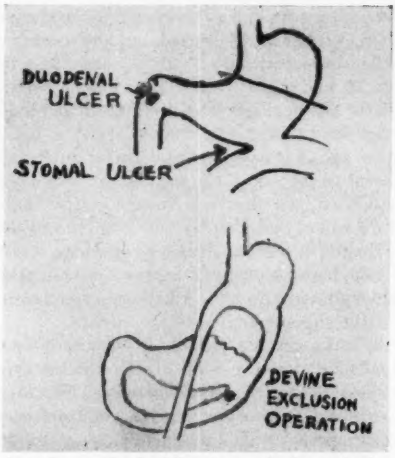

FIG. 3. Case 6. Showing the method of Devine pyloric exclusion operation that proved successful in the treatment of a stomal ulcer following gastroenterostomy.

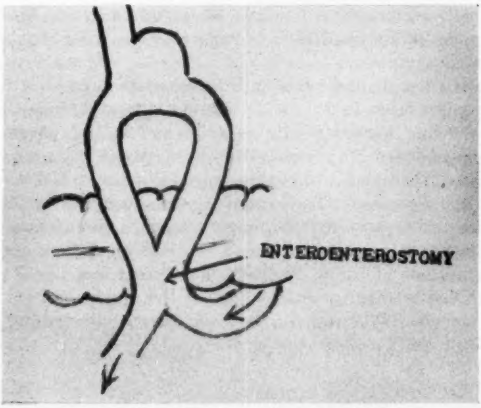

FIG. 4. Case 7. Stomal ulcer developed following high gastric resection with entero-enterostomy between limbs of jejunum used in the anastomosis.

ing symptoms for about 1 year. She then developed a microcytic hypochromic anemia which appears to have responded favorably to total hysterectomy in November 1952, for functional uterine bleeding. She was suspected in 1955 of having another stomal ulcer, but under conservative treatment, she seems fairly comfortable at the present time.

It has been everyone's experience with whom I have discussed the subject, and of those who have commented in the literature, that stomal ulcers following gastric resection for gastric ulcers are of infrequent occurrence. Our own experience with almost an equal number of gastric and duodenal ulcers coming to surgery indicates that the incidence of occurrence following surgery for duodenal ulcer is about 10 times more frequent depending upon the type of surgery done. A gastrojejunocolic fistula following gastric resection for gastric ulcer, I believe, is of sufficient rarity to justify its being reported.

Case 9. A Japanese male, age 48, was first seen on Dec. 31, 1954, complaining of epigastric

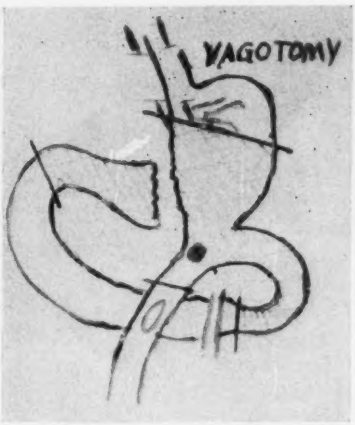

FIG. 5a. Case 8. Showing vagotomy, amount of stomach removed with attached jejunum containing the stomal ulcer.

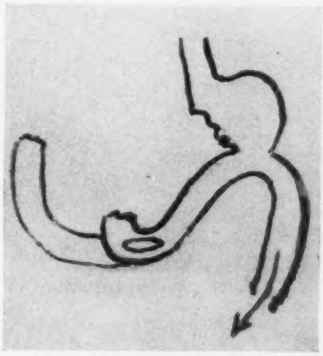

FIG. 5b. Case 8. Reconstruction of gastrointestinal continuity

pain and burning of 3 years' duration. Following x-ray examination a year previously, he had been told he had a peptic ulcer and was placed on medical treatment. Improvement was noted for a while but symptoms had recurred of greater severity. Repeat x-ray examinations showed a penetrating ulcer of the lesser curvature of the stomach (fig. 6). There was no x-ray evidence of a duodenal ulcer. On Jan. 14, 1955, a subtotal gastric resection was done removing about 60 per cent of the stomach. A retrocolic, Polya-Hofmeister type of operation was carried out. There was no evidence of past or present involvement of the duodenum. The patient made a good recovery.

A gastrointestinal study was done on March 12, 1955, and again on Jan. 14, 1956, because the patient was complaining of epigastric distress coming on 2 to 3 hours after meals relieved by alkalis and drinking milk. Nothing abnormal was noted. Re-examination of the stomach was done on Oct. 22, 1956, because epigastric symptoms had become more severe and the patient during the past 2 weeks had developed diarrhea. Ingested barium was noted to fill the remaining stomach and limbs of the jejunal anastomosis and to pass directly into the colon. Barium given per rectum not only filled the colon but the remaining stomach as well (fig. 7). These findings substantiated the diagnosis of gastrojejunocolic

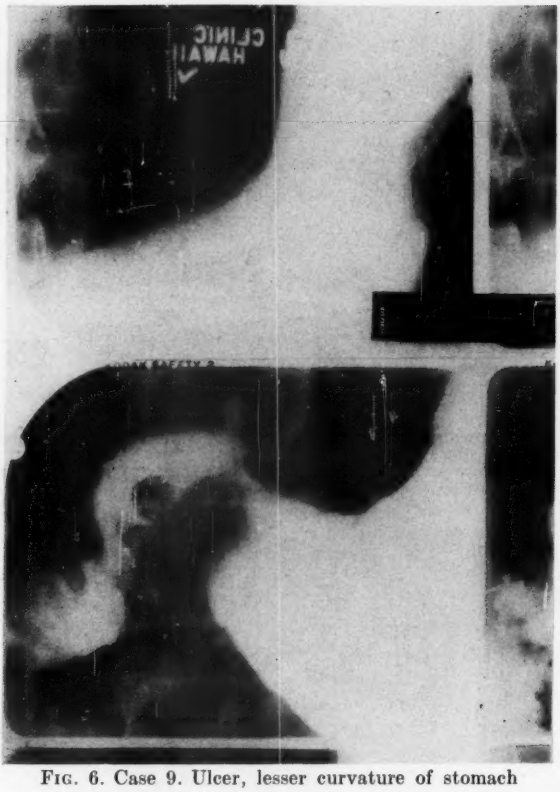

FIG. 6. Case 9. Ulcer, lesser curvature of stomach

fistula. A gastric analysis showed, without Histamine, a pH of 3 and free hydrochloric acid, a trace. After Histamine, pH was 1.2 with 4 plus hydrochloric acid.

On Oct. 30, 1956, the patient was again subjected to surgery after several days' preparation of the large bowel with sulfasuxidine and 48 hours with neomycin. The afferent and efferent limbs of the jejunum were severed, being left attached to the stomach, and an end to end anastomosis of the jejunum was done. The stomach was freed from the mesocolon and a high resection of the stomach was carried out. The vagus nerves were resected bilaterally and a retrocolic anastomosis between the jejunum and stomach was made distal to the enteroenterostomy. The perforation in the colon was quite small and was easily closed without resorting to resection. The patient has made a good recovery.

A gastrojejunocolic fistula is always a condition of grave concern because of the extent and difficulties of surgery necessary for its correction and frequently because of the nutritional changes that have taken place in the individual before the condition is recognized, making the patient a very poor surgical risk. Fortunately in the case reported, the patient was brought to surgery before such changes had occurred.

In 1935, Lahey,[6] in discussing this subject, had the following to say: "We must admit that when we are faced with a patient with gastrojejunal ulcer which has perforated into the transverse colon and produced a gastrojejunocolic fistula of

FIG. 7. Case 9. Showing filling of stomach following barium enema

large caliber and surrounded as they always are by a large area of induration, we are still considerably at a loss as to how it can be surgically cared for with reasonable safety." In 8 patients operated upon at the Lahey Clinic, the mortality had been 63 per cent.

Individuals suffering from such a complication give a history, as previously mentioned, for gastrojejunal ulcer, and in addition when perforation into the colon occurs, there is added severe indigestion, belching of foul-smelling gases and at times vomiting of material resembling colonic content. Diarrhea is the rule, depending for severity, usually, on the size of the fistulous opening. Undigested food may be noticed in the stools. Anorexia, rapid loss of weight, anemia and rapid physical deterioration is the rule. One individual, to my knowledge, was thought to have sprue until the true nature of the trouble was recognized.

While there is no effectual medical treatment in the cure of this condition, to operate precipitately without adequate rehabilitation of the individual is almost assurance of a fatal outcome. Since Dr. Lahey's gloomy remarks in 1935, a great many conditions have come about both in prophylaxis, in early recognition, and in pre and postoperative care of these individuals that materially improves the ultimate outcome.

Pfeiffer[9] in 1941 called attention to the following facts, the recognition of which has added greatly to the understanding of this problem.

1. The most serious consequence of gastrojejunocolic fistula arises from admission of colonic content to the stomach and jejunum rather than from the loss of food from the stomach through the fistula.

2. Loop colostomy proximal to the fistula is the best means of relieving symptoms and facilitating rehabilitation.

3. Preliminary colostomy permits successful correction of the fistula by the necessary radical measures in a clean field and protects the repair of the colon.

In 15 patients treated by this plan, the mortality had been 6.6 per cent.

In 1943, Lahey and Marshall described a new method of procedure that they has used quite successfully, incorporating the same underlying principle as that first advocated by Pfeiffer. The terminal ileum was anastomosed to the upper part of the descending colon. Approximately 2 months later, after adequate rehabilitation of the patient, the entire right half of the colon to beyond the fistula was removed along with high gastric resection. Their technic gives a more adequate exposure of the involved structures and allows minimal contamination of the operative field when the colon has to be resected. They reported 8 cases in which the patient was so treated with 1 surgical death.

In the intervening years, the use of antibiotics and all other pre and postoperative measures now so routinely made use of in all major surgical undertakings have added greatly towards solving the problems of gastrojejunocolic fistula which was viewed with so much pessimism by Dr. Lahey in 1935.

DISCUSSION

In the forty-odd years in which I have observed and participated in the surgery for gastroduodenal lesions, many operative procedures once embraced with acclaim have been discarded because of well-recognized imperfections. Some of these procedures are being rediscovered and are again being applied unwisely, while new procedures are being extolled as having virtues that are as yet unproved by that most exacting crucible of all adequate lapse of time. It is with exceeding difficulty, as everyone appreciates, that we arrive at the truth of things. Gastroenterostomy, long thought to be the great panacea for all benign lesions of the stomach and duodenum, has at long last been laid to rest with few remaining lamentors. The Billroth I operation used extensively for many years was discarded by most surgeons because of too many unhappy experiences. It is again being used in some quarters with enthusiasm. That this is an operation unfitted for the treatment of duodenal ulcers is again rapidly becoming apparent. The duodenum is frequently scarred and deformed making its safe anastomosis with the stomach difficult. Even though as much as 75 per cent of the stomach is resected, most observers have found that the incidence of subsequent anastomotic ulcers is far greater than when the same amount of stomach is removed and a Billroth II type of anastomosis is used. Goligher and associates[4] recently reported on the results of 186 resections of the stomach for duodenal ulcer followed for 3 years or longer. In 80, the Billroth I type of operation had been used,

and in 106, the Polya-Hofmeister modification of the Billroth II operation had been done. In both types about 75 per cent of the stomach was resected. In the Billroth I operation, 11 recurrent ulcers had been proved by reoperation and 3 suspected by x-ray and gastroscopic examinations, an incidence of 17.5 per cent. In the Billroth II operations, 1 recurrent ulcer was proved by operation, and 1 was suspected by x-ray and gastroscopic examinations, an incidence of 1.9 per cent. They further stated that postgastrectomy symptoms were about equal though slightly in favor of the Polya procedure. Recently Wallenstein[10] reporting from Stockholm, Sweden, found an incidence of 11.7 per cent recurrence of ulcer following Billroth I operations in 204 cases of duodenal ulcer and 4.2 per cent in 347 cases when the Billroth II procedure was used. Surprisingly, it was found in the female patient that there was no significant difference in frequency of recurrence for the two types of operation. The advantages of the Billroth I operation, they found, include a lower frequency of postoperative anemia, of marked postcibal symptoms and of postoperative losses of weight. The shortest period of observation of these cases had been 4 years and the longest approximately 20 years.

The high incidence of recurrent ulcers following Billroth I operations for duodenal ulcers, I believe, has been rightfully attributed to the lack of bathing the area of anastomosis with an alkaline medium as furnished by bile, pancreatic excretion and succus entericus. Performing an enteroenterostomy between the limbs of the jejunum anastomosed to the stomach, a popular procedure in years past, predisposes to the same complication. The longer the loops and the farther the enteroenterostomy from the opening into the stomach, the greater is this danger. It is also recognized that the farther the anastomosis between the stomach and intestine from the pylorus, the more susceptible the mucosa of the intestine becomes to hydrochloric acid. The low incidence of anastomotic ulcers following resection of the stomach for gastric ulcers has been referred to. It is believed by some, Walters[11] of the Mayo Clinic in particular, that they occur more frequently following Billroth I operations. Wallenstein found 2 recurrences in 33 gastric ulcers, none in 48 patients in whom the Billroth II operation was used. It seems logical to me that this would be the case for the reason above stated. I cannot speak of the merits of the Billroth I operation versus the Billroth II procedure from experience since I have rarely used the Billroth I operation. It is best suited, I believe (in selected cases), to resection of the stomach for carcinoma since no one, to my knowledge, has reported a stomal ulcer following any type of operation for this condition.

In 1925,[2] and again in 1928,[3] Devine of Melbourne described and recommended his gastric exclusion operation in selected patients for benign ulcers of the stomach and duodenum. The operation consists of cutting across the stomach in about its midportion, leaving the distal portion intact, and anastomosing the proximal stomach to the jejunum. Devine maintained that this procedure resulted in producing a much lower gastric acidity than followed gastroenterostomy. I used this operation in 12 patients with gratifying results in most and disastrous results in 1, as has been described. The importance of removing the

antrum to eradicate the hormonal component of gastric acidity had not at that time been appreciated to the extent that it is today. Needless to say, this operation was short lived.

The present controversy regarding the role that vagotomy should play in the treatment of benign ulcers of the duodenum and those recurrent ulcers about which we have been speaking has not yet received sufficient observation in length of time to permit drawing final conclusions. However, the work of Dragstedt in reactivating interest in this subject appears to have very definite beneficial effects in selected patients.

There seem to be many factors at work in the physiology of the stomach and duodenum, many of which we are ignorant in our present state of knowledge. We, in common with everyone else interested in this subject, have found that some procedures giving excellent results in some individuals are utter failures under what seems to be similar circumstances in others.

CONCLUSIONS

It takes many years to determine whether or not any given operation for benign gastric or duodenal ulcer will ultimately prove to be successful. Therefore, the value of any of the more recent procedures advocated for the treatment of these conditions will necessitate many years of observation to properly evaluate their worth.

At the moment hemigastrectomy plus vagotomy appears to offer advantages superior to other operative procedures in the treatment of duodenal ulcers. Adequate reduction of gastric acidity plus preservation of sufficient stomach to prevent most postgastrectomy symptoms are the important features of this operation.

The long recognized inadequacy of gastroenterostomy in the treatment of duodenal ulcer is again emphasized.

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CONTROL OF POST-TRANSURETHRAL PROSTATIC RESECTION HEMORRHAGE BY BILATERAL LIGATION OF THE HYPOGASTRIC ARTERIES

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Hemorrhage from the prostatic fossa following transurethral resection of the prostate represents one of the most annoying of the complications that may occur following that procedure. Although in most instances the bleeding can be controlled by simple measures such as insertion of a urethral catheter and irrigation of clots from the bladder and prostatic fossa, occasionally more drastic measures must be instituted. These might consist of fulguration of active bleeding points by the transurethral or suprapubic approach, insertion of a suprapubic cystostomy tube, or insertion of a pack into the prostatic fossa. To this armamentarium is now added another procedure, bilateral ligation of the hypogastric arteries.

The following case presents a problem in the management of repeated profuse hemorrhages from the prostatic fossa following transurethral resection of the prostate. A similar situation might occasionally confront the urologist, and it is hoped that this case report will be helpful in the solution to such a problem. Bilateral ligation of the hypogastric arteries is certainly not recommended as routine procedure in cases of post-transurethral resection hemorrhage, but should be used only after other methods of control have failed.

CASE REPORT

W. T., a 61 year old Negro man, was originally admitted to the General Surgical Service of Kennedy Veterans Administration Hospital, Memphis, Tennessee, because of abdominal discomfort and gaseous distention of the abdomen after eating. Chest roentgenogram, upper gastrointestinal and gallbladder series were normal and the patient was transferred to the Genito-Urinary Service for evaluation of his genitourinary complaints of reduction in the caliber of his urinary stream, dysuria, urinary frequency and difficulty starting his urinary stream. Intravenous urography was essentially normal except for upward deviation of the distal end of each ureter of the "fish-hook" type deformity associated with prostatic hyperplasia.

Physical examination revealed a well-developed, well-nourished Negro man not appearing acutely ill. His blood pressure was 170/110. There was a Grade I systolic heart murmur heard at the apex, and the apical beat was slightly lateral to the midclavicular line. A small umbilical hernia was present with slight tenderness in the epigastric region and over the gallbladder area. The prostate was firm, smooth with Grade I enlargement. The remainder of the physical examination was essentially normal. Cystoscopy revealed trilobar hyperplasia of the prostate gland. Routine laboratory data were within normal limits.

On March 1, 1957 a transurethral resection of the prostate with removal of approximately 40 Gm. of tissue was performed. Postoperative catheter drainage was slightly blood-tinged. No complications occurred during the procedure. On March 9 a sudden profuse hemorrhage occurred from the urethra of a projectile, pulsatile nature with an estimated 1000 cc. blood loss. The patient went into shock with a blood pressure of 70/50. Intravenous fluids and 1000 cc. of whole blood were administered with abrupt cessation of bleeding after irrigation

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of clots. On March 13 there was severe hemorrhage again from the urethra with approximately 1000 cc. blood loss. A transfusion of whole blood was administered and bleeding stopped spontaneously. On March 18 the urethral catheter was removed but had to be reinserted because of bright red bleeding from the urethra. On March 27 no bleeding had occurred for 9 days. The patient was discharged from the hospital but returned immediately because of severe hemorrhage from the urethra; estimated 1000 cc. blood loss. The catheter was reinserted and a blood transfusion given.

On April 2 severe urethral hemorrhage reappeared with approximately 1000 cc. blood loss. Once more the bleeding stopped following the insertion of a catheter and a transfusion. On April 12 profuse hemorrhage from the urethra with estimated 1000 cc. blood loss occurred again. The patient's condition now shows evidences of systemic manifestations from repeated severe blood loss. On April 16 urethral hemorrhage with 800 to 1000 cc. blood loss was again repeated. Suprapubic cystostomy was performed, and at the time of surgery a pulsating vessel could be felt in the region of the bladder neck at the 9 o'clock position. There was no active bleeding at that time. The vessel was approximately 1 cm. in diameter and could be felt coursing into the distal prostatic fossa. Two suture ligatures were placed about the vessel in the region of the bladder neck; however, the pulsation was still present in the prostatic fossa distal to the sutures where no ligatures could be placed. On April 21 another hemorrhage through the suprapubic catheter occurred with estimated blood loss of 1500 cc., stopping spontaneously following blood transfusion. On April 23 hemorrhage through the suprapubic catheter and urethra with 800 to 1000 cc. blood loss was repeated. On April 24 hemorrhage with estimated 1000 cc. blood loss again occurred. On April 25 hemorrhage with estimated 800 cc. blood loss now creates need for more definite hemostatic procedure. Suprapubic cystostomy and packing of the prostatic fossa was performed. Blood could be seen welling into the bladder from the prostatic fossa at the time of surgery but no active bleeding point could be identified. On April 27 hemorrhage again, this time through the prostatic pack, was observed. Hemogram revealed the following: platelet count 876,850; bleeding time 4½ minutes; negative tourniquet test; clot retraction good in 1 hour; prothrombin time 41 per cent; clotting time 7 min., 15 sec. There was no familial history of a bleeding tendency and no personal history of unusual bleeding episodes. Hematology Department did not believe that a bleeding disorder was present in this case.

On April 27 bilateral ligation of the hypogastric arteries in continuity was performed using the extraperitoneal approach through McBurney incisions in both lower quadrants of the abdomen. Cessation of hemorrhage was immediate and permanent. Forty-one units of blood of 500 cc. each had been administered since March 9.

On June 20th urethral catheter was removed after the suprapubic wound had been dry of urine for 10 days. No bleeding occurred since April 27. No further transfusions were given. On June 24 there was no leakage of urine. Patient was discharged from the hospital with the following hemogram; white blood cells 8,200; neutrophils 70 per cent; lymphoyctes 29 per cent; eosinophils 1 per cent; red blood cells 4,230,000; Hgb. 13.2 Gm.; hematocrit 38 per cent.

DISCUSSION

No case of bilateral ligation of the hypogastric arteries for a post-transurethral prostatectomy hemorrhage has been reported in the American literature, to our knowledge, although several reported cases included hypogastric ligation for the control of hemorrhage from other causes.[2] The blood supply to the prostate is derived primarily from the inferior vesical artery with the middle hemorrhoidal and internal pudendal sending a few small branches to the inferior segment.[1] It was thought that the hemorrhage encountered in this patient was possibly from an anomalous branch of the right hypogastric artery supplying the prostate. This assumption was based on the profuse nature of the hemor-

rhages, the bright red arterial type bleeding, the finding of the large pulsating vessel in the region of the bladder neck at the time of the suprapubic cystostomy, and the rapid onset of shock at the time of the hemorrhages. Because of the collateral blood supply from the superior, middle, and inferior hemorrhoidal arteries and from the deep epigastric and external pudendal arteries, ischemic complications should rarely arise following bilateral ligation of the hypogastric arteries. In this case there was a delay in the closure of the suprapubic fistulous tract and a similar occurrence was reported by Willner and Hamm.[3] In their patient, transabdominal ligations of the hypogastric arteries were performed for uncontrollable hemorrhage following suprapubic prostatectomy. Hypogastric ligations were done within the first 24 hours following the prostatectomy in their patient, and 57 days following the transurethral resection in our patient. It was thought to be a life-saving procedure in both instances.

Transurethral fulguration of the bleeding area was considered but was not thought feasible in this instance because of the profuse hemorrhage which we believed would make visualization of the bleeding point almost impossible. Also, it was thought that fulguration of the prostatic fossa when bleeding was not present would be followed possibly by slough of the eschar and even more marked hemorrhage later.

The extraperitoneal approach to the hypogastric arteries was chosen in this case primarily to prevent contamination of the peritoneal cavity from the patient's potentially infected suprapubic wound; however, the transperitoneal approach may be used in properly selected patients.

SUMMARY

A case of bilateral ligation of the hypogastric arteries for the control of hemorrhage following transurethral resection of the prostate gland is presented. It is not believed that a similar case has been reported in the American literature. It was thought that the profuse hemorrhages in this particular case were possibly due to an anomalous branch of the right hypogastric artery, and a similar situation would probably rarely be encountered by the practicing urologist. However, bilateral ligation of the hypogastric arteries is a relatively simple operative procedure which one may use in cases of uncontrollable postprostatectomy hemorrhage. No ischemic complications resulted from the procedure other than a delay in closure of the suprapubic fistulous tract.

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THE SURGICAL TREATMENT OF ACUTE OBSTRUCTIVE DIVERTICULITIS: REPORT OF A CASE

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Notwithstanding modern surgical technic, the mortality of acute obstruction of the large bowel remains high. Early symptoms of obstruction of the large bowel, unlike those in the small bowel, are frequently indefinite and insidious. Vomiting is not an early feature. Usually, the patient attributes his symptoms to constipation and frequently, catharsis is freely resorted to, before a physician is consulted. It is not exceptional to see such patients hospitalized after they have suffered from obstructive symptoms for a week or even longer.

CASE REPORT

Mrs. X, a white woman aged 58, had complained for about 1 week of abdominal pain. There had been no nausea or vomiting. Obstipation had become an increasing problem. She had undergone a cholecystectomy about 5 years previously and her symptoms were attributed to adhesions.

About 24 hours before admission to the hospital, she developed abdominal pain, nausea, and vomiting. Her admission physical examination and laboratory studies were compatible with an intestinal obstruction. Barium enema roentgenogram showed an obstruction at the sigmoid flexure.

Abdominal exploration, under spinal anesthesia and through a left paramedian incision, revealed turbid fluid in the peritoneal cavity and an obstructing mass in the sigmoid flexure.

The mass had the characteristics of an acute diverticulitis. An adherent loop of small bowel was freed from the sigmoid and a perforation, about 2 cm. in diameter, in the sigmoid, was noted. A transverse colostomy was established with considerable difficulty, due to extensive adhesions.

Postoperatively, it was observed that the colostomy was not functioning. After several days of supportive therapy, she was again taken to the operating room and the abdomen was re-explored. Lysis of multiple small bowel obstructing adhesions was performed. Within a few days, she developed a small bowel fistula. Approximately 3 weeks postoperatively, she died.

Technic of Cecostomy (as practiced by the writer)

In retrospect, it would seem that a cecostomy, under the conditions presented by this patient, would have been a simpler and less formidable procedure.

The merits of cecostomy are not stressed sufficiently in the literature. It may be a life-saving procedure. It is interesting to note that in many cases, as the acute obstruction is relieved, edema of the bowel subsides and the patient may have spontaneous bowel movements per rectum.

The usual right McBurney incision is made (never a right rectus incision). The peritoneum is opened very carefully, to avoid injuring the distended cecum. If the cecum is only moderately distended, and the cecal wall is fairly normal, the median peritoneal border is tacked to the median aspect of the cecum by a few interrupted sutures, thereby excluding the cecum from the general peritoneal cavity. A small piece of iodoform gauze is placed around the periphery of this

space and a purse-string suture is placed in its center. A no. 14 or 16 gauge hypodermic needle, to which is attached a long, fine rubber tube, is used to puncture the cecum. This permits the escape of gas, with the immediate reduction of cecal distention.

If the cecum is markedly distended and its wall almost of tissue paper consistency, the procedure should be modified. The peritoneal cavity is gently walled off, and the cecum is punctured as described above. After the distention has become reduced and the cecal wall resumes a more normal appearance, the peritoneum is then sutured to the cecum.

A purse-string suture is placed in the exposed area of cecum and a cruciate stab wound is made, through which a large Pezzar catheter is introduced. The purse-string suture is tied snugly around it. The primary iodoform gauze is removed and fresh iodoform gauze is placed into the wound. A silk suture holds the catheter against the skin.

The skin wound is closed with a few interrupted silk sutures. No sutures are used in the fascia or muscle tissue. The Pezzar catheter is connected with a glass cannula attached to a long rubber tube, draining into a container. The catheter need not be retained for a long period.

The wound is kept open until the radical procedure is carried out and normal evacuation per rectum is re-established.

The cecostomy technic, practiced as described, favors spontaneous healing without a hernia.

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EDITORIAL

TRANSFUSIONS

Most of us forget the youthfulness of transfusion of blood as a widespread therapeutic procedure. Practical storage and transportation of blood really began with World War II. A decade and a half or two decades is a very brief span in any phase of our medical knowledge. Blood transfusion is not a static procedure, but because of its very youthfulness, it is constantly undergoing change. Much work has been going on which will be of widespread importance in the forseeable future.

Knowledge of the blood fractions has already accumulated to the point where a much more rational and economic use of a unit of donated blood is already possible on a wider scale than is now employed. Blood supplies are perhaps not unlimited and the most complete utilization of the donated unit is rapidly becoming imperative.

The production of blood cells and blood plasma in the body are not by any means always interconnected. The replacement of plasma constituents even in acute blood loss, may not be as imperative as the replacement of blood cells. Certainly in the preparation of many anemic patients for surgery plasma constituents are not necessary. Many of the whole blood transfusions could be replaced by packed cell transfusions, without hazard to the patient, thus making available large quantities of plasma for other use.

The work with prolonged room temperature storage of plasma as a means of eradicating the hepatitis virus is encouraging. With a more exact use of the blood components, the production of units of plasma in this manner would not be a hardship to most blood banks. Perhaps a third of our current use of blood could be utilized as packed cells with a consequent increase in available plasma.

As to the further fractionation of the plasma little needs to be added. Fibrinogen, Serum Albumen, Gamma Globulin and their increasing place in our every day therapy are too well known. It is well to remember, however, that there are other fractions and that research studies are continuing in an attempt to find their proper usefulness.

We are often reminded of the inherent risks in transfusions not the least of these is circulatory overload. All of us must be conscious at all times of the problems of this so-called simple procedure. All of us should be conscious that overuse or under-use of whole blood or its component parts are equally dangerous. We all will have a part in determining the role of blood transfusions in the next decade. The intelligent use of the proper components of blood in a given patient is demanded.

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BOOK REVIEWS

The Editors of THE AMERICAN SURGEON *will at all times welcome new books in the field of surgery and will acknowledge their receipt in these pages. The editors do not, however, agree to review all books that have been submitted without solicitation.*

Pioneer Surgeons Of the Woman's Hospital. By JAMES PRATT MARR, M.D., F. A. Davis Company, Philadelphia, Pa. 148 pages, copyright 1957.

Dr. James Pratt Marr has presented delightfully in this small volume the life stories of "four daring and skillful surgeons whose activity at the Women's Hospital (New York) spanned the last half of the nineteenth century." These four men were James Marion Sims, Thomas Addis Emmet, Edmund Randolph Peaslee and Thomas Gaillard Thomas, each of whom is known to us today because of his pioneer work, skill and prestige in the then nonexistent field of gynecology.

The term gynecology was not used until 1847. It may be said to have had its beginning as a surgical specialty in 1809 when Ephraim McDowell performed the first successful ovariotomy. J. Marion Sims opened up the field of vaginal plastic surgery with his work on vesico-vaginal fistula. His classic paper "On the Treatment of Vesico-Vaginal Fistula" was published in The American Journal of the Medical Sciences in 1852. His second great achievement was the founding of the Woman's Hospital in the State of New York in 1855. Here over the past century many of the leaders in the field of Gynecology received their training and advanced gynecology by their numerous contributions.

In 1874 Sims quarreled with the Lady Supervisors of the Woman's Hospital, over the admission of patients with malignant genital disease, and resigned. He was followed by Dr. Thomas Addis Emmet and in turn by Edmund Randolph Peaslee and Theodore Gaillard Thomas. Each of these men was an outstanding surgeon in the field of gynecology.

Emmet's operations involving the urethra, bladder, perineum, vagina and cervix, were for his day and age masterpieces of reconstructive surgery. When Emmet was forced to relinquish his long tenure as the sole surgeon at Woman's Hospital, all four surgeons Sims, Emmet, Peaslee and Thomas were appointed surgeons of equal rank. Peaslee's crowning achievement was a literary one—his textbook "Ovarian Tumors and Ovariotomy" was published in 1872. It was said of him that he did more to put this operation on a secure footing than any other surgeon in America. Thomas, the last of this famous quartet surpassed each of the others, and possibly all others of his time, in his knowledge of the anatomy of the pelvic floor.

Through these men and in this hospital a systematic method of operative gynecology was evolved. The large number of competent and successful young surgeons trained in this atmosphere are outstanding examples of its fine and daring traditions. The reader gains some insight into this great past as the devotion of the author, to the place and his subjects, peeps from behind the skillfully drawn portraits of four great surgeons.

ROBERT W. BUXTON, M.D.

Methods in Surgical Pathology. By HENRY A. TELOH, M.D., Charles C Thomas, Springfield, Illinois, 127 pages, price $4.75.

This is a practical handbook in which the author, a pathologist, details a fine everyday routine system used in the processing of pathologic specimens from the operating room. It is a complete outline even to the types of forms used for recording and reporting of specimens. Also including are methods of indexing, as well as what to look for in a surgical specimen, how to properly cut and block the specimen, as well as detailed procedures for certain types of tissues, including radical neck dissections, breast amputations and abdominal lesions where lymph node appraisal is important.

The technics described are those which are used daily by any competent pathologist in the practice of surgical pathologic diagnosis. It is presented in a clear fashion, unattended

by significant variation from general customary procedures. Illustrations are few. There
no mention of staining or special technics. There is nothing in the volume concerni
interpretation of pathologic material. It is literally a concise workbook of technic. T
volume is useful as an introduction for the beginning pathology resident and might also
useful for the surgical resident spending a period of time in a Department of Patholo
as a part of his preparation for the practice of general surgery. It should serve to emphas
to the practicing surgeon what he should demand in the way of proper surgical pathol
technic.

JOHN A. WAGNER, M.D.

Wire Brush Surgery. By JAMES W. BURKS, JR., Associate professor of Clinical medici
dermatology, Tulane University, School of Medicine.

Note is made of renewal of interest in the subject started when Dr. Pete Iverson
Philadelphia advocated sandpapering of acne scars as a Plastic Surgery procedure in 194
The book traces the history of Abrasive Surgery from 1550 B.C. with the use of pumice,
today. Dermal planing, using rotating burrs was done as early as 1905 by Dr. Kromayer
so no claim can be made for a new procedure. The wire brush has been substituted b
Dr. Burks and others for the mechanical burr and has been widely used for the past 5 yea
by numerous Dermatologists. The report continues with an excellent chapter on Sk
Anatomy and one on Healing. Detailed explanations are given and shown pictorially of a
needed equipment, anesthesia and technique. Postoperative care as practiced by Derma
tologists, differing considerably from that used by surgeons, is shown.

Complications are honestly discussed without, however, a very definite listing of ste
to prevent them. The chapter on Indications and Contra-indications offers many instanc
for the surgeon to disagree:

(1) Wire brush planing of acutely infected acne lesions, or sebaceous cysts, which th
surgeon thinks should be opened and, or excised.
(2) Planing of traumatic scars which are generally of single scar tissue cell covering any
way—Prefer excision and fine line closure—Planing results not adequate.
(3) Planing of tattoos generally found by the surgeon inadequate because of depth o
pigment.
(4) Planing of pigmented nevi thought inadvisable by most Dermatologists and Surgeon
because of danger of malignancy.
(5) Planing of keloids seems to be asking for trouble, and to advocate Planing of Epithelio
mas is most fool-hardy.

The first two thirds of this book, in so far as history equipment and technic is concerne
is very good, but much criticism can be made of the discussion in the latter portions.

C. PARKE SCARBOROUGH, M.D.

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